AQUATIC OLIGOCHAETA OF THE WORLD: SUPPLEMENT
A CATALOGUE OF NEW FRESHWATER SPECIES, DESCRIPTIONS, AND REVISIONS

by
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ABSTRACT

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The literature for the decade 1971 to 1981 is reviewed for all of the primarily aquatic families of Oligochaeta, and many of the more recent major publications have been included. Some opinions as to possible synonymies are presented, but should not be regarded as decisions without further study of type material. Some transfers of species between genera are made, resulting in the following new combinations: *Lumbriculus ambiguus* (Holmquist), *Lumbriculus genitosetosus* (Holmquist), *Stylodrilus sovaliki* (Holmquist), and *Varichaetadrilus minutus* (Brinkhurst). *Ilyodrilus mastix* Brinkhurst will be transferred to a new genus elsewhere.

The most significant change since 1971 has been the recognition of intraspecific variation of and environmental effects on the setal form in the Naididae, where serrations on the hair setae and pectinations in the bifid needles has and will continue to lead to new synonymies, especially in *Dero, Nais* and *Pristina*.

key words: Annelida, Clitellata, Oligochaeta, Lumbriculidae, Haplotaxidae, Naididae, Tubificidae, Phreodrilidae, Opistocystidae, Narapidae, Aphanoneura, Lake Baikal, freshwater, new spedies, revision, systematics.

RÉSUMÉ

Le présent rapport couvre un examen des ouvrages publiés de 1971 à 1981 et aussi des publications plus récentes sur les familles d'Oligochaeta principalement aquatiques. Certaines opinions sur des synonymies possibles sont émises mais elles ne doivent pas être considérées comme des décisions sans une étude plus poussée des types. Quelques espèces sont classées dans un autre genre, générant les nouvelles combinaisons suivantes: *Lumbriculus ambiguus* (Holmquist), *L. genitosetosus* (Holmquist), *Stylodrilus sovaliki* (Holmquist) et *Varichaetadrilus minutus* (Brinkhurst). *Ilyodrilus mastix* Brinkhurst fera partie d'un autre genre.

Depuis 1971, la reconnaissance de la variation intraspécifique de la forme des soies dans la famille Naididae et de l'incidence environnementale sur celles-ci represente le plus important changement. Dans cette famille, les dentelures des soies et les structures pectinées des aiguilles bifides mèneront, comme par le passé, à de nouvelles synonymies surtout chez *Dero, Nais* et *Pristina*.

Mots-clés: Annelida, Clitellata, Oligochaeta, Lumbriculidae, Haplotaxidae, Naididae, Tubificidae, Phreodrilidae, Opistocystidae, Narapidae, Aphanoneura, la Baikal, eau douce, nouvelle espece, revision, systematique.

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Comment: The abbreviation "um" will be designated for micron throughout this text.

INTRODUCTION

This contribution is intended to provide an annotated list of freshwater oligochaete genera and species described or revised since the global review of the literature on this subject in Brinkhurst and Jamieson (1971). All names appearing in print have been catalogued by Reynolds and Cook (1976, 1981) together with the location of type specimens, where these still exist. The present listing goes further by indicating the major diagnostic characters of new taxa, and by suggesting possible synonyms. This approach should not be regarded as a formal taxonomic revision based on the examination of old and new material, but rather a way of setting up such revisions by subsequent authors. We consider that this may be of value to those wishing to publish species descriptions, revise copies of regional keys, or recognize synonyms employed in the wider, non-taxonomic literature. Time and space does not permit full taxonomic revisions here, nor would the timing be appropriate in many instances.

Marine species, most of them making up the subfamily Phallodrilinae, are omitted because too many descriptions are being introduced to allow any new insights to be developed here. Two major reviews are provided elsewhere (Brinkhurst, 1982; Giere and Pfannkuche, 1982).

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FAMILY LUMBRICULIDAE

Genus *Lumbriculus* Grube, 1844

1. *Lumbriculus olgae* Sokolskaya, 1976
(1976: p. 46; Fig. 3)

This species resembles *Lumbriculus japonicus* (see below) in location of the anterior nephridia, presence of anterior and posterior sperm sacs, single pair of atria, but differs from it in having the vasa deferentia entering the distal third, opening proximally, extent of pharygeal glands, size (much shorter with fewer segments) prostomium shape and biannulation of the segments et. al.

Distribution: Chukchi Peninsula, U.S.S.R.

2. *Lumbriculus alexandrovi* Popchenko, 1976
(1976*a*: p. 1618; Pl. 1)

Description not translated. Distribution: Karelia, U.S.S.R.

3. *Lumbriculus kareliensis* Popchenko, 1976
(1976*a*: p. 1620; Pl. 2a-b)

Description not translated. Distribution: Karelia, U.S.S.R.

4. *Lumbriculus tetraporophorus* Popchenko, 1976
(1976*a*: 1622; Pl. 2c-2e)

Description not translated. Distribution: Karelia, U.S.S.R.

(See also *Thinodrilus*, below)

5. *Lumbriculus kolymensis* Morev, 1982
(1982: p. 663; Pl. 1)

Description not translated. Distribution: Northeastern U.S.S.R.

Other *Lumbriculus* material:

Sokolskaya (1976) referred to *Lumbriculus inconstans* as a synonym of *L. variegatus*, but preferred to regard *L. japonicus* as a distinct species, as in *L. sachalinicus*, all by details of the male ducts such as position of vasa deferentia and the muscles of the atrial walls. *L. multiatriatus* is regarded as a distinct species by both Cook (1971*a*) and Sokolskaya (1976). Holmquist (1976) preferred to see *L. inconstans* as not only a valid species but a member of the genus *Thinodrilus*, a name unused since 1906 (see Cook (1971*a*) for

synonymy). The name is, therefore, a nomen oblitum and should not be used (see below). Holmquist also regarded *L. mukoensis* Yamaguchi as a species, in addition to those discussed above.

Timm (1979) synonymized *Lumbriculus kareliensis* Popchenko with *L. variegatus*, and described variations in the reproductive organs of the latter.

(?)Genus *Thinodrilus* Smith, 1895

1. *Thinodrilus ambiguus* Holmquist, 1976 Fig. 1H
(1976: p. 405; Figs. 17-20)

Setae bifid with reduced upper teeth. Fragments easily. Dark colour. Pre-genital nephridia are absent. Male elements (testes, funnels, vasa deferentia) one, two (a pair) three, or four (two pairs) but atria one or two (a pair). Atria in VIII (once in VII). Single funnels and vasa deferentia may be the anterior or posterior of an original pair. Atria oblong to tubular, prostate layer and bundles. Slender cuticular penes present. Spermathecae variable, one to three or more, paired or single per segment, posterior to atria, usually in second segment from atria. Pores ventro-lateral. This species is compared with *Thinodrilus inconstans* (see below).

Distribution: U.S.A. (Alaska).

2. *Thinodrilus genitosetosus* Holmquist, 1976 Fig. 1I
(1976: p. 398; Figs. 13, 14)

Light to dark wine colour, greenish. Fragments easily. Setae bifid, upper teeth reduced. Nephridia in VII and XII then irregularly. Two pairs testes, male funnels, vasa deferentia usually in IX and X, on pair atria in X. Sperm sacs present. Atria long, tubular, prostate a conspicuous layer and as stalked bundles. Slender cuticular penes. Straight needle-like male genital setae present.

Distribution: U.S.A. (Alaska).

The position of the male elements varies. The modified genital setae are unique. Strangely, similar hair-like setae also have been observed in a specimen of *Haplotaxis* cf. *gordioides* by Brinkhurst (unpublished), another rarely sexual species (as the *Lumbriculus - Thinodrilus* group).

Other *Thinodrilus* material:

Thinodrilus inconstans Smith, 1895 has been held to be a synonym of *Lumbriculus variegatus* by many authors apart from Yamaguchi (see Sokolskaya, 1976). Holmquist (1976) regarded it as a valid species as it has two pairs of testes, male funnels and vasa deferentia associated with a single pair of

atria (in VIII, IX, or X). Specimens of *L. variegatus* have been seen with two male funnels associated with each atrium, but the anterior one has always lacked a vas deferens. These three taxa all quite clearly belong to *Lumbriculus*, serving to confirm that the genus derives its tendency to the single posterior pair of male ducts per segment to loss of the anterior pair. The whole reproductive system is disrupted in these species due to their adoption of architomy (and perhaps parthenogenesis). Where species begin and end with such taxa is an especial problem, but Sokolskaya (1976) did find several useful characters that may not be so affected by reproductive habit.

If the genus were not a synonym of *Lumbriculus*, it should be re-named as *Thinodrilus* is a nomen oblitum. The museum material examined by Holmquist has not been identified as the type series.

Genus *Lamprodrilus* Michaelsen, 1901

1. *Lamprodrilus jamburaensis* Hrabe, 1980
(1980: p. 101; Figs. 1-9)

In contrast to *Lamprodrilus michaelseni*, the atrial ampullae of *L. jamburaensis*, without prostates, measure 100 um in diameter; the atrial muscle layer measures 17-28 um thick, with ventral setae of X 125 um, dorsals 97 um, with large penial sacs (versus 60 to 70 um, 6.5 to 10 um, 150 um, and 120 um, respectively). The prostate cells are 50 um long, maximum, versus 50 to 70 um, and only cover part of the atria. This species differs from *L. mrazeki*, which reproduces by architomy in cysts, causing variation in number and position of genital segments. It is similar to these species in size (diameter less than 1 to 5 mm) and lack of copulatory glands. It has two pairs of male pores. The dorsal setae are shorter than the ventrals. There is no proboscis. Most other species live in Lake Baikal.

Distribution: Ob River, northern U.S.S.R.

2. *Lamprodrilus issossimovi* Morev, 1982
(1982: p. 665; Pl. 2)

Translation not available. Distribution: Northeastern U.S.S.R.

Other *Lamprodrilus* material:

Holmquist (1976) divided the genus into *Lamprodrilus, Teleuscolex* and *Agriodrilus*, and suggested the subgenus *Metalamprodrilus* be promoted. The latter was defined by Isossimov (1962) for four species previously merely regarded as subspecies. Once again, these are species with the male organs increased in number to three of four pairs (see *Lumbriculus*).

Timm (1970) discussed *Lamprodrilus isoporus* from Esthonia, describing the cocoons and suggesting that those described by Svetlov (1936) belonged to a different species. This species was recently found in Lake Siljan (99 m), Sweden by T. Wiederholm (identified by Brinkhurst, unpublished record), March 1979.

Genus *Trichodrilus* Claparede, 1862

1. *Trichodrilus montenegrensis* Karaman, 1973 Fig. 1J
(1973: p. 356; Figs. 7-10)

Male pores on X, spermathecal pores on XI and XII. Atria small, globular, with vasa deferentia entering laterally. Lateral blood vesels clearly visible in anterior segments.

Distribution: Skadar Lake, Yugoslavia.

This species is said to be similar to *T. moravicus* by the form of the anterior segments, the number and position of the testes and spermathecae, and to differ by the form of the atrium (pear-shaped in *T. moravicus*), the number of prostate glands (ten in *T. montenegrensis)*, and the spermathecae (which have shorter ampullae and no ducts in *T. moravicus*). Several characteristics, such as the pharyngeal gland distribution, were not described. No other species were discussed.

2. *Trichodrilus pauper* Finogenova, 1973
(1973: p. 122)

Pharyngeal glands in IV to XII. Male pores in X, spermathecal pores in XI and XII. Vasa deferentia open into the upper half of the pear-shaped atria, (154 um x 98 um or as little as 70 um x 39.2 um); muscle layers 8.4 to 11.2 um. Prostate cells dense all over atria. Penes small. Spermathecae with ducts.

Distribution: Caspian Sea, U.S.S.R.

Finogenova (1973) considered that, while *Trichodrilus pauper* is closely related to *T. hrabei*, the species differ in thickness of body wall, opening of vasa deferentia into atria, and shape of atrium. No other species is discussed. Median and posterior segments were missing. No illustrations were presented.

3. *Trichodrilus itchaensis* Sokolskaya, 1973
(1973: p. 1714; Figs. 1-3)

One specimen. The body wall is quite thick; in XIV the epidermis is 15 to 17 um with longitudinal muscles 21 um thick. Pharyngeal glands in IV to VI. Male pores on X, spermathecal pores on XI. Vasa deferentia enter atria just above origin of atrial duct, and enter lumen 1/3 way up atria from base. Atrial ampullae ovoid, prostate cells 67 um thick, epithelial layers 13 um, muscle 40 to 50 um thick. Penes conical, 25 um x 21 um. Spermathecae with long sacciform ampullae and thick-walled ducts. Lateral posterior blood vessels not sufficiently preserved to describe.

Distribution: Kamchatka, U.S.S.R.

This species was compared to six others, including *Trichodrilus spelaeus* Mosynski. The wide atrial muscles are distinctive, similar to those of *T. ptujensis* Hrabe. The form of the atria and position of the vasa deferentia are said to be distinctive, as are the position of the pharyngeal glands. The author suggests ratios of thicknesses of body wall and atrial layers be used in place of actual dimensions.

4. *Trichodrilus allegheniensis* Cook, 1971*b* Fig. 1K
(1971: p. 381; Fig. 1)

Prostomium with proboscis, unique in the genus to date. Worm 20 mm x 0.85 to 1.1 mm. Male pores on X on small porophores, spermathecal pores on XI and XII. Body wall is thick (28 um epidermis, 35 um longitudinal muscles). Pharyngeal glands from IV to VII. Posterior lateral blood vessels absent. Vasa deferentia open near apices of elongate cylindrical atria.

Distribution: Tennessee, U.S.A.

5. *Trichodrilus culveri* Cook, 1975 Fig. 1L
(1975: p. 26; Fig. 1)

Male pores on X, spermathecal pores on XI. Atria globular to pear-shaped, vasa deferentia entering medially. Atrial lining cells 9 to 12 um thick, muscles 3 um thick. Penes absent. No posterior lateral blood vessels.

Distribution: West Virginia, U.S.A.

This species is closely related to *T. sketi* and *T. pragensis*, both of which have thin atrial muscles (and clearly separable from the other species of the group with one pair of spermathecae and lack of posterior lateral blood vessels). In *T. culveri* the spermathecae have two distinct sections, thick-walled apically but thin-walled basally. The spermethecal ducts also differ.

6. *Trichodrilus aporophorus* Popchenko, 1976 Fig. 1M
(1976*b*: p. 139; Fig. 1A-c)

Male pores on X, spermathecal pores XI and XII, body wall relatively thick. Pharyngeal glands IV to VII. Blind-ending branched lateral blood vessels present (? anteriorly). Vasa deferentia enter atria medially, the latter spherical, with short penes not protruding beyond body wall (Cook (1975) stated that penes are absent in *T. culveri* - see above - in which they appear similar according to illustrations). Atrial walls thick, epithelium 12 to 17 um, muscles 27 to 30 um. Vasa deferentia medial. Prostate cell layer 90 um thick. Spermathecal ducts long.

Distribution: Onega Lake, U.S.S.R.

This species is closest to *T. hrabei* Cook, but is distinguished by size and shape of the atria, position of vasa deferentia, form of penes and atrial muscle width. The setae of *T. aporophorus* are larger than normal, and the position of the spermathecal ampullae are said to be diagnostic.

7. *Trichodrilus gordeevi* Popchenko, 1978 (*In* Timm and Popchenko, 1978) (1978: p. 113)

Male pores in X, spermathecal pores in XI. Vasa deferentia open into upper third of atria, which are long, pear-shaped, and end in conical penes. The spermathecal ampullae lie in XII, with sigmoid ducts in XI. Pharyngeal glands are in V to VI.

Distribution: Murmansk, U.S.S.R.

This taxon is associated with those species possessing a a single pair of spermathecae. The blood vessels are not described in the English language summary of the description. There are no illustrations.

8. *Trichodrilus seirei* Timm, 1979 (1979: p. 160; Fig. 2) Fig. 1N

Species only 4 to 10 mm long. Male pores on X, spermathecal pores on XI to XII. The body wall epidermis is 6 to 8 um thick, the longitudinal muscles 24 to 32 um. Pharyngeal glands in III to VI. No postclitellar transverse blood vessels. Atria oval to spherical, prostates weakly developed. Atria vary in size and in insertion of the vasa deferentia.

Distribution: Esthonia, U.S.S.R.

The species belongs to the group with two pairs of spermethecae and no posterior lateral blood vessels. The characters separating this species from others are admittedly plastic according to Timm, who agreed with Cook (1971*a*) that several of the species described may be reduced to ecological forms of subspecific rank.

Other *Trichodrilus* material:

Hrabe (1971) re-described *Trichodrilus pragensis* Vejdovsky from material collected for the first time in over century.

The pharyngeal glands lie in V to VIII or IX. The lateral blood vessels are absent posteriorly. Atria in X, with short penes on short prophores. Atria oblong oval to spherical, spepermathecae in XI. The supposed second pair of spermathecae seen by the original describer in partially mature specimens are believed to have belonged to a distinct species by Hrabe. He also suggested that *Trichodrilus sketi* may prove synonymous with *T. pragensis*, but cannot decide this issue as the material of *T. sketi* is said to have been badly fixed.

Kasprzak (1979) re-described *Trichodrilus cernosvitovi* Hrabe and *T. moravicus* (in Polish).

Cook (1971*a*) and Timm (1979) suggested that many of these species may be synonyms of others. There is a tendency here to assume that each locality will produce endemic *Trichodrilus* species, and so several possibly variable characteristics are used to separate taxa, often based on very few specimens. Sokolskaya (1973) indicated that ratios of parameters such as atrial length/breadth and widths of epithelial/muscle layers were more appropriate than absolute sizes, as entire specimens can vary in size. Hrabe (1938) demonstrated size variations in *T. moravicus*, even within a single locality, which contrasts with his opinion about the significance of size in *Stylodrilus* species (see above).

Genus *Stylodrilus* Claparede, 1862

1. *Stylodrilus chukotensis* Sokolskaya, 1975
(1975: p. 116; Figs. 1-4)

Setae simple-pointed. Vasa deferentia enter basal third of atria. Penes small, conical, retractile. Atria egg-shaped. Sokolskaya (1975) showed that the shapes of the atria in the *Bythonomus* group of species varies (cylindrical, tubular, egg-shaped, etc.) as does the position of entry of the vasa deferentia (base, middle, distal half, distal third of atria). This new species seems closest to *S. absoloni* (Hrabe, 1970), the atria being smaller with thinner walls, the vasa deferentia being less basal in insertion. The oesophageal glands of *S. chukotensis* end in V, but reach to VII-VIII in *S. absoloni*.

Distribution: Chukot Peninsula, U.S.S.R.

2. *Stylodrilus absoloni* (Hrabe, 1970)
(1970: p. 302; Figs. 38-44)

This species was described as *Bythonomus*, transferred to *Stylodrilus* (*sensu* Brinkhurst 1965) by Sokolskaya (1975) - see above. Of the various *Bythonomus* group species discussed by Sokolskaya (1975), this differs from the others as follows: atria egg-shaped (differs from *Stylodrilus lemani*, *S. aurantiacus*, *S. mirus*) with vasa deferentia entering basally (as opposed to distal third of ampullae or about middle of ampullae as in *S. sulci* and *S. chukotensis*). The blood vessels resemble those of *S. subcarpathicus*. Hrabe (1970) compared it with *S. subcarpathicus*, *S. lemani*, and *S. aurantiacus*.

Distribution: Moravia, Czechoslovakia.

3. *Stylodrilus longiatriatus* Dembitsky, 1976 Fig. 1Q
(1976: p. 1723; Figs. 1-7)

Segments biannulate from VI. Setae simple-pointed, dorsals shorter than ventrals. Dorsal blood vessel posteriorly has two pairs of blind-ending lateral vessels with 4 to 9 processes. Vasa deferentia enter basal third of atria (but run in the wall to open on third the way from the top). Small conical penes. This species resembles *S. lemani* and *S. aurantiacus* of the *Bythonomus* group (blood vessels) but differs in the elongate-ovate atrial shape and the position of the opening of the vasa deferentia (said to be the proximal third by Dembitsky (1976) in contrast to the base or middle of the ampullae in the other two species. It is classified as a *Stylodrilus* without comment about *Bythonomus*.

Distribution: Crimea, U.S.S.R.

4. *Stylodrilus sovaliki* (Holmquist, 1976) n. comb. Fig. 1O

Bythonomus sovaliki Holmquist, 1976
(1976: p. 378; Figs. 1-3)

Setae simple-pointed. Dorsal vessel with blind-ending more or less branched lateral vessels postiorly. Vasa deferentia open into atria medially (though the illustration clearly shows it in the upper third), atria round to oblong, or pear-shaped, discharge through small papillae.

Distribution: Alaska, U.S.A.

The atria here are clearly of the shorter, rounder *Stylodrilus* type rather than the usually taller *Bythonomus* type, and the vasa deferentia differ in position from those of most known species; being closest to those of the *Stylodrilus* group according to the figure in contrast to the claim by Holmquist that they are medial. The body may be biannulate from V though the text does not make this clear. The blood vessels are somewhat like those of *S. subcarpathicus*. Holmquist (1976) compared this taxon with the *Bythonomus* group. If we assume the dorsal and ventral setae to be alike (not stated), the species resembles *S. absoloni* (see above) as concluded by Holmquist. The differences lie in the septal glands (IV to V or VI here, IV to VII or VIII in *S. absoloni*) and the setae (shorter and thicker in *S. sovaliki*).

5. *Stylodrilus minutus* Hrabe, 1970
(1970: p. 293; Figs. 14-20)

Secondary annulation from XIII to IX. Setae bifid with short upper tooth. Atria pear-shaped, vasa deferentia entering upper third. Small conical penes present.

Distribution: Lake Baikal, U.S.S.R.

This species is separated from those with longer penes (*Stylodrilus heringianus, S. brachystylus, S. cernosvioti*, of the *Stylodrilus* group) and

those with seccndary annuation beginning in IV or V (*S. parvus, S. leucocephalus*) or VI to VII (*S. asiaticus, S. crassus*). The body is narrower than the similar *S. opisthoannulatus*, being only 0.3 to 0.65um, the setae are smaller, and the walls of the atria differ.

6. *Stylodrilus beattiei* Cook, 1975 Fig. 1P
(1975: p. 28; Fig. 2)

Secondary annuli from V, setae simple-pointed. Atria globular to pear-shaped, vasa deferentia join basally to medially. No lateral blood vessels on dorsal vessel posteriorly.

Distribution: U.S.A.

This species resembles *S. sulci* in that it lacks lateral posterior blood vessels, unlike the rest of the *Bythonomus* group (which is, therefore, one reason for the union of *Bythonomus* with *Stylodrilus*). In this new species the posterior vasa deferentia do not enter XI as they usually do in this genus, the prostates are very weakly developed, and the atria are short and round.

7. *Stylodrilus (Bythonomus) tschaunensis* Morev 1982
(1982: p. 667; Pl. 3)

Description not translated. Distribution: Northeastern U.S.S.R.

Other *Stylodrilus* material:

Hrabe (1970) added several new details to the knowledge of this genus, regarded by him as two genera. The following are some of the major points:

Stylodrilus group:

1. *Stylodrilus parvus* and *S. leucocephalus*: These two species both were found in Lake Ohrid. Hrabe therefore suggested that their different size is a good taxonomic character. Other details of the separation are given.

2. *Stylodrilus asiaticus*: Secondary annulation from VI to VII (not V). Distal end of seta in III illustrated as simple-pointed, upper tooth said to be frequently worn off.

3. *Stylodrilus opisthoannulatus*: Secondary annulation distinct from IX. Vasa deferentia enter atria together below apical end, higher than shown in original description. The epithelial linings of the atria are conspicuous, the lumina being largely occluded.

4. *Stylodrilus sulci*: Atria not tubular but oval and elongate.

5. *Stylodrilus lemani*: Setae never bifid (a confusion due to inclusion of some *Lumbriculus* in Claparede's collection). Secondary annulation from V. Variation in blood vessels is described.

6. *Stylodrilus lankesteri*: Shown to be synonym of *S. lemani* by Hrabe, as suspected by Cook (1971*a*).

Hrabe (1970) still maintained that *Bythonomus* is separable from *Stylodrilus* by virtue of the differences in setae, posterior blind-ending lateral blood vessels and the position of the openings of the vasa deferentia into the atria.

The problem is that not all *Bythonomus* species have lateral blood vessels said to be characteristic, and the vasa deferentia patently do not enter the atria only basally or apically, but rather in every possible position from basal to apical. Some descriptions of the blood system have clearly suffered in translation, as in my earlier reference to blind appendages of lateral vessels as lateral vessels. Some recent authors accept the union of these genera, notably Sokolskaya (1975), Dembitsky (1976), and Morev (1982), while others such as Holmquist (1976) do not. The very considerable confusion of original attributions to the two genera when separate is a clear indication of the lack of distance between them!

Stylodrilus heringianus is no longer thought to be an introduction to North America (Cook, 1975) though it is not as frequently seen there as in Europe. It has surely been introduced to New Zealand (Marshall, 1978).

Timm (1979) reported *S. brachystylus* Hrabe from the U.S.S.R, and described and illustrated it.

Genus *Guestphalinus* Michaelsen, 1933

Hrabe (1973) recorded *Guestiphalinus wiardi* from Yugoslavia, as a single (damaged) specimen smaller than the German originals. The posterior vasa deferentia do not enter the post-atrial segment.

Genus *Eclipidrilus* Eisen, 1881

1. *Eclipidrilus levanidovi* Sokolskaya, 1977 (1977: p. 296; Figs. 1-2) Fig. 1T

This species has the reproductive system offset by two segments (spermathecae in VII, atria in VIII) in contrast to the usual position (IX to X). In this it resembles *Styloscolex macer* Sokolskaya, 1976 (see below). Both are found on the Chukotski Peninsula, U.S.S.R., but *S. macer* has two pairs of spermathecae. This new species has spiral muscles in the atrial wall typical of *Eclipidrilus* however. The species differs from other

Eclipidrilus in possessing porophores and cuticular penis sheaths, and while it resembles *E. daneus/E. palustris* in some respects, it lacks the rudimentary anterior vasa deferentia of those species.

Distribution: Chukotski Peninsula, U.S.S.R.

Sokolskaya (1977) discussed the possible derivation of *Styloscolex* from *Eclipidrilus*, and that the diversity of reproductive structures suggested a subgeneric division of *Eclipidrilus* in the future. Holmquist (1976) would re-erect *Mesoporodrilus* simply because of the median fusion of the male ducts. As the genus is so small, and everyone is aware of the close relationship between these two plus *Premnodrilus*, subgeneric ranking is certainly preferred to the creation of numerous small genera. This is especially true in this instance, as only two specimens of *Mesoporodrilus* have ever been seen.

Wassel (1984) recently revised the genus *Eclipidrilus*, dividing the genus into three separate subgenera: *Eclipidrilus (Eclipidrilus)* Eisen, 1881, *Eclipidrilus (Premnodrilus)* Smith, 1900, new rank, and *Eclipidrilus (Leptodrilus)*, new subgenus, based on characteristics of the reproductive systems. In addition, one new species, *Eclipidrilus (Leptodrilus) fontanus*, is described. A key to the seven species in these three subgenera was provided.

2. *Eclipidrilus (Leptodrilus) fontanus* Wassel, 1984
(1984: p. 80; Figs. 1, 2)

Segments number 64 to 108; length to 31 mm, preserved; diameter 0.6 mm at II, 0.8 mm at X. Prostomium rounded, as long as wide at peristomial junction. Segments II to VIII with secondary annulations. Setae 93 to 253 um long. Testes paired, present in X, present or absent in XI. Two pairs of male funnels present in anterior septa 9/10 and 10/11. Atria paired, 0.3 to 0.4 mm long, cylindrical, may extend to XIII, consisting of spiral muscles ca. 45 um thick, diameter ranging 132 to 379 um. Penes paired in IX, may extend to X; ampulla pear-shaped to ovoid, ca. 275 um long, 200 um wide. Spermathecal ducts distinct, with uniform diameter ca. 25 um, no muscle thickening of the duct, ca. 300 um long, open on IX. This species closely resembles *E. (L.) lacustris* except for the paired arrangement of reproductive structures.

Distribution: Pennsylvania, U.S.A.

Genus *Rhynchelmis* Hoffmeister, 1843

1. *Rhynchelmis alaskana* Holmquist, 1976 Fig. 1U
(1976: p. 363. Figs. 4-7)

Size: 80 mm x 1.5 mm. Proboscis long and thin. Setae mostly simple-pointed, rarely with a trace of an upper tooth. Pharyngeal glands in VI to VI or III to V. Adults with ventral glands in III to VIII. Atria in X,

extending through X to XV unless coiled; small penial papillae. Ovaries and female funnels in XI. Spermathecae one pair in VIII; no connection with gut. Body wall muscle bands not curled at edges.

Distribution: Alaska, U.S.A.

This species would key out to *R. orientalis* in Cook (1971*a*) but it differs from that species in lacking rudimentary anterior vasa deferentia and funnels.

2. *Rhynchelmis brooksi* Holmquist, 1976
(1976: p. 390; Figs. 8-11)

Size: 28 mm x 0.7 to 0.8 mm. Short proboscis with superficial segmentation. Spermathecae and male pores in VIII and X, along with large ventral glands. Setae bifid with sub-equal teeth set side by side. Pharyngeal glands IV to V or III and VI too. Large spermathecal glands paired, single or absent. Glands in atrial segment paired or even 3. One pair of male funnels, vasa deferentia and atria in X. Atria extend back to XII or XIII, prostates on ental 1/4 to 1/3 of atria. No penes. Spermathecae in X, or lacking, or unilateral in VII to VIII or paired in VIII with one in VII, connected to gut.

Distribution: Alaska, U.S.A.

The bifid setae are distinctive. Ventral glands were described in *Rhynchelmis alaskana* (above) and *R. glandula* Altman (thought to be synonymous with *R. elrodi* Smith and Dickens, by Cook 1971*a*) but they are median in those species. The spermathecae have large anterior diverticulae, as in *R. tetratheca* and *R. vejdovskyi*. The atria coil in XI and only enter XII and have histologically distinct regions.

Other *Rhynchelmis* material:

Rhynchelmis glandula Altman is said to be distinct from *R. elrodi* according to Holmquist (1976) because of the median ventral glands. She also preferred to separate *Sutora* (*S. rostata* Eisen) from this genus, despite the remarkable similarity of the atria. Appendages on the spermathecae seem do not seem much more unusual to this senior author than the diverticulae described in three species now (see above).

Rhynchelmis tetratheca Michaelsen was re-described by Timm (1979).

Genus *Tatriella* Hrabe, 1936

1. *Tatriella longiatriata* Popchenko, 1975
(1975: p. 295; Figs. 1A-D)

This species differs from *Tatriella slovenica* Hrabe (the sole other species) as follows: elongate atria reaching to XII and covered with prostate cells; vasa deferentia join the atrium medially rather than basally; shape and size of spermathecal ampulla, although the illustration does not support this claim nor is it explained in the English abstract.

Distribution: Onega Basin, South Karelia, U.S.S.R.

Genus *Styloscolex* Michaelsen

1. *Styloscolex (Neoscolex) macer* Sokolskaya, 1976 Fig. 1R
(1976: p. 46; Figs. 1-2)

Atria in VIII, with sperm funnels, male ducts and testes. Ovaries in IX. Setae simple-pointed. Spermathecae in VI and VII. Pharyngeal glands in III to IV. Vasa deferentia enter distal parts of atrial ampullae, which are long, sacciform, with thin walls, penes massive. Prostates sparse.

Distribution: Chukchi Peninsula, U.S.S.R.

This species lacks the curious sterile segment between the testes and ovary-bearing segments of the eight other species, known from Lake Baikal (6), China (1) and Japan (1), and has two pairs of spermathecae.

2. *Styloscolex (Neoscolex) sokolskajae* Morev, 1978
(1978: p. 1267; Fig. 1A-E)

Setae simple-pointed. Male pores VII, female pores in VIII/IX, spermathecal pores in VI. Vasa deferentia join atria basally, above short penes.

Distribution: Chaun River Basin, U.S.S.R.

The reproductive system is one segment anterior to those of *S. macer*; it has only one pair of spermathecae and other featues.

Other *Styloscolex* material:

Holmquist (1974; 1976) described additional *Styloscolex opisthothecus* Sokolskaya material from Alaska, in addition to material from Kamchatka (U.S.S.R.). The original description (Sokolskaya, 1969) was noted in the Appendix to Brinkhurst and Jamieson (1971). It is 40 mm long x 0.75 to 1 mm, with male pores on VIII, spermathecal pores on XI, and female pores on X/XI. Testes in VIII, ovaries in X. Vasa deferentia enter atria basally, atria elongate, tubular.

While *Styloscolex tetrathecus* Burow has spermathecae both in front of and behind the gonadal segments, the other species have them only in front. This species has the spermathecae posteriorly, as the name suggests.

Genus *Spelaedrilus* Cook, 1975
(1975: p. 30)

1. *Spelaedrilus multiporus* Cook, 1975 Fig. 1V
(1975: p. 30; Fig. 3)

This strange species has the atria duct divided into four ducts on each side, giving male pores on X, two pairs of spermathecal pores on IX associated with two spermathecae. The ovaries are in XI. The atria are elongate, with two male ducts on each, serving testes in X. There are no posterior lateral blood vessels. Massive glands surround the spermathecal and male pores, but the prostates are absent. The elongate atria and basal vasa deferentia are reminiscent of *Stylodrilus (Bythonomus) subcarpathicus* (Hrabe) but the division of the gonopores is unique. The genus is between *Stylodrilus* and *Hrabea* Yamaguchi. The two pairs of male ducts but one pair of testes are seen in *Eclipidrilus* and *Rhynchelmis*, but the glands replacing prostates are unusual (though there are such glands in *Rhynchelmis*, paired in *R. brooksi*, see above).

Genus *Kurenkovia* Sokolskaya, 1969

This genus was mentioned by Brinkhurst and Jamieson (1971) in the Appendix but was not noted by Holmquist (1976). This genus has since been assigned to a separate family by N. Sokolskaya in a recent publication (Sborn. trud. Zool. Mus., Moscow Univ.) not yet available to us (Finogenova, pers. comm.). The family definition includes setae paired in four bundles, two pairs of testes and male funnels in VIII/IX, two pairs of male pores in IX, the vasa deferentia having run rearwards in between the muscle and epithelium of the body wall, and copulatory glands near the four male pores (? megadrile prostates). Ovaries and funnels in X, spermathecae in VII, rudimentary atria in VIII. This is supposed to indicate a close relationship between the Haplotaxidae and Lumbriculidae. The prosoporous relic atrium in VIII is a lumbriculid trace, perhaps, as in the prosopore state of the posterior pair of male ducts. The above description, based on a personal communication from N. Finogenova, does not mention atria in IX, which this senior author takes to be replaced by the separate glands (? prostates).

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FAMILY HAPLOTAXIDAE

All of the species in this small but highly significant family in terms of evolutionary studies were attributed to the single type genus *Haplotaxis* by Brinkhurst (1966), although this should be regarded as a holding operation pending an objective decision regarding generic criteria. The senior author hopes to provide this revision in the foreseeable future. It may suffice to point out that there is an assemblage of species or subspecific taxa closely resembling *H. gordioides* in which the dorsal and ventral setae differ markedly (among other characteristics) that will probably be separable as *Haplotaxis* s.s. (*H. gordioides, H. heterogyne, H. ascaridoides*). The number of dorsal setae varies. They may be absent in many segments, or present in all - as in North American specimens attributed to *H. gordioides*. *Haplotaxis ascaridoides* was reported by Hrabe (1974) from L. Teleckoje in addition to the original locality Lake Baikal. Hrabe also expanded the description of (*Pelodrilus*) *ignatovi*. An undescribed S. American species has setae of the *gordioides* type but has hair-like penial setae (Brinkhurst - personal observation).

1. *Haplotaxis ichthyophagus* Gates, 1971
(1971: P. 204)

Dorsal setae smaller than ventrals, missing from posterior half of body. This species falls into the *Haplotaxis gordioides* group, but all specimens were immature. The worms are found in salmon redds. It is probably a synonyn of *H. gordiodes*.

Distribution: California, U.S.A.

2. *Haplotaxis corbarensis* Delay, 1972 Fig. 1A
(1972: p. 328; Figs. 1-3)

Setae ornamented. Testes in X and XI, ovaries in XII-XIII. Female ducts do not penetrate 12/13 or 13/14. Cutaneous glands in VIII-XIII. The setae differ in detail from those of *Haplotaxis bureschi*.

Distribution: France.

3. *Haplotaxis navarrensis* Delay, 1973 Fig. 1B
(1973: p. 405; Fig. 1)

Setae ornamented and heeled. Testes in X and XI, ovaries in XII and XIII. Female funnels do not penetrate septa 12/13 or 13/14. Spermathecae paired in VI-VIII. Cutaneous glands in IX-XII. The setae are like those in *Haplotaxis leruthi* but differ in detail.

Distribution: Spain.

4. *Haplotaxis cantabronensis* Delay, 1973 Fig. 1C
(1973: p. 409; Figs. 1, 2)

Setae ornamented. Testes in X and XI, ovaries in XII and XIII. Female gonoducts do not penetrate setae 12/13 or 13/14. Spermathecae paired in VI-VIII. The setae are similar to those of *H. bureschi* and *H. corbarensis*, but cutaneous glands are limited to IX-XI.

Distribution: Spain.

5. *Haplotaxis brinkhursti* Cook, 1975 Fig. 1E
(1975: p. 32; Fig. 4)

Setae sigmoid, paired, unornamented. Testes in X and XI, ovaries in XIII. Female ducts penetrate 13/14. Spermathecae paired in VIII-IX. The reproductive system is unique in the family and of importance phylogenetically.

Distribution: West Virginia, U.S.A.

6. *Tiguassu reginae* Righi, Ayres, and Bittencourt, 1978 Fig. 1F
(1978: p. 6; Figs. 1-4)

Worm with proboscis, and paired sigmoid nodulate setae. Testes in XI, ovaries in XII, male and female ducts both plesiopore and quite similar, rudimentary additional male ducts drain X. Spermathecae in IX and X. This is another phylogenetically interesting species that shows the possibility of a tubificine gonadal sequence in a haplotasic, clearly derived from a form with two pairs of testes (See Righi et. al. 1978).

Distribution: Brazil.

7. *Haplotaxis ornamentus* Brinkhurst and Fulton, 1980 Fig. 1D
(1980: p. 1; Figs. 1-5)

Setae ornamented. Testes in X and XI, ovaries in XII and XIII. Spermathecae paired in VII and VIII. This species has only two pairs of spermathecae, in contrast to the European species with ornamented setae.

Distribution: Tasmania.

Other *Haplotaxis* material:

Hrabe (1974) re-described *H. ignatovi* (Michaelsen) and *H. ascaridoides* Michaelsen from Lake Teleckoje (USSR). The former is known only for this lake, the second from Lake Baikal. Hrabe found the spermathecae of *H. ignatovi* (which he attributed to *Pelodrilus*) in VII-VIII or only VIII, or even one in VII and a pair in VIII as opposed to the original account, which suggested that they lie in VIII to IX. While immature specimens of *Haplotaxis*

s.s. were reported earlier as *H. gordioides*, Hrabe showed that one almost mature specimen to be identifiable as *H. ascaridoides*. This species is so similar to *gordioides* that Brinkhurst (1971) reduced it to a subspecies of the latter, supposedly restricted to Lake Baikal.

Brinkhurst (1982) reported *Haplotaxis heterogyne* Benham occurring in Tasmania, a species not seen since its original description by Benham (1903) from New Zealand. Another New Zealand specimen may belong here, too. This species is in the *H. gordioides* group.

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FAMILY NAIDIDAE

The taxonomy of this family has been affected by the discovery of intraspecific variation and environmental modification of setal form. The senior author has long suspected that intraspecific variation could eliminate some of the species, which are separated by quite slight distinctions; he is not alone in this suspicion. Pop (1973) described two *Pristina* species but suggested that several species might be reduced to subspecific rank. Kasprzak (1972) discussed variation in *Chaetogaster* and Kasprzak and Szczesny (1976) referred to variability in *Pristina*. More dramatically, Loden and Harman (1979) revealed ecophenotypic variation in setal forms which resulted in the synonymization of *Pristina foreli* with *P. aequiseta*. Needle setae of *Pristina osborni*, *Nais communis* and a *Dero* species were shown to become pectinate under certain conditions, while setae of other individuals in the populations were shown to remain bifid. The implications of the studies of Loden and Harman are quite disruptive to previously established taxa; for example: *Pristina osborni* may join *P. arcaliae*, *P. idrensis*, and *P. jenkinae* (for *e.g.*) as possible synonyms for *P. rosea* as claimed by Pop (1977). *Nais africana* Brinkhurst could become a possible synonym for *N. communis*, and so on. Recent reliance on setae alone to determine naidid generic placement (as in Brinkhurst's *Vejdovskyella hellei*, *Specaria fraseri* and examples from the work of others) is clearly dangerous. Indeed, such heavy reliance on setal form for generic decisions even when other characters are available is debatable - but then the issue is really one of intraspecific variation in any character as evidenced by unpublished studies of the nephridia of *Paranais/Wapsa*, which apparently vary quite substantially. Dr. R. Grimm (pers. comm.) noted that serration of hair setae and presence of intermediate teeth in bifid needles were really a matter of degree of development rather than presence or absence as described in most species definitions. The use of scanning electron microscopy enables these small differences to be seen quite readily.

It always has been our experience that keys to the naidids work rapidly and easily all the way to the final dichotomy. It is possible that such fine differences established by the typological method have little practical value for ecologists, but the resolution of that issue depends on an increase in the amounts of field work on this family, which only has just begun.

Space does not permit the authors to review the many contributions to the zoogeographic data on the family by authors such as K. V. Naidu (India) and D. H. Di Persia (Argentina). The bulk of the recent taxonomic works seems to have emanated from the Louisiana laboratory of Dr. W. J. Harman and his students. Dr. R. Grimm in Hamburg is contributing to the revision of earlier work as well as reporting his own African material. Hiltunen and Klemm (1980) provided a key to the North American species.

Subfamily Chaetogasterinae

Genus *Chaetogaster* von Baer, 1827

1. *Chaetogaster diversisetosus* Sporka, 1983
(1983: p. 137; Figs. 1-9)

This species closely resembles *Chaetogaster setosus* (Svetlov) apart from the presence of some bifid setae.

Other *Chaetogaster* information:

Kasprzak (1972) synonymized *Chaetogaster crystallinus* with *C. diaphanus*, and (1981) accepted *C. krasnopolskiae* Lastockin as a valid species.

Specimens of *Chaetogaster diastrophus* bearing dorsal setae from VI (opposite the second set of ventral setae, as those of III-V are absent) were independently reported by Hiltunen and Klemm (1980) and Brinkhurst and Kathman (1983). They were also observed by Lafont (1981*a*), who classified the material as *Pseudochaetogaster longmeri* n. gen. n. sp. because the original generic definition of *Chaetogaster* includes the absence of all dorsal setae. Lafont (1981*b*) redescribed *Chaetogaster parvus* Pointner, suggesting that it no longer be regarded as a synonym of *Chaetogaster langi* Bretscher.

Genus *Amphichaeta* Tauber, 1879

The species described as *Homochaeta raptisae* Chapman (1981) proved to have no dorsal setae in II. The upper teeth of the ventral setae change from slightly shorter than the lower to clearly longer, and while the change is not so dramatic as in *Amphichaeta americana*, both features suggest the species be transferred to this genus. The dorsal setae (at least) are commonly pectinate (or have a single intermediate tooth). Hair setae are absent in this species (see Brinkhurst and Kathman, 1983).

Subfamily Paranaidinae

Genus *Paranais* Czerniavsky, 1880

1. *Paranais birtsteini* Sokolskaya, 1971
(1971: p. 930; Figs. 1-6)

The body of this worm is covered with transverse folds full of secretion. The setae have longer distal than proximal teeth, but are more abundant than in *Paranais frici* and *Wapsa mobilis*, in which the atria differ also.

Distribution: Kamchatka, U.S.S.R.

2. *Paranais multisetosa* Finogenova, 1972 Fig. 2A
(1972: p. 94; Figs. 1-5)

The ventral setae in segment II possess teeth equal in length, with the rest of the setae exhibiting a proximal tooth shorter than the distal. Setae are 8 to 10 in number in II, with 3 to 4 or 3 to 6 in the other bundles; 3 posteriorly. This species differs from *Paranais simplex* in a number of characteristics.

Distribution: U.S.S.R.

Other *Paranais* material:

Brinkhurst and Coates (in press) have shown that *Paranais* and *Wapsa* are a single genus, that *P. frici* and *W. mobilis* are synonyms, and that *P. birsteini* is found on the Pacific coast of North America. The differences between the various species described are debated.

Genus *Wapsa* Marcus, 1965

See *Paranais* - the major character separating this genus from *Paranais* may be questionable as nephridial development varies intraspecifically according to Ms. K. Coates (pers. comm.). The following species is transferred to *Paranais* by Brinkhurst and Coates (in press).

1. *Wapsa grandis* Harman, 1977
(1977: p. 483; Fig. 1A-D)

This American member of the genus differs from the two existing species largely by non-overlapping ranges in the lengths of the setae. As indicated by the name, this species has the largest setae of the three. Harman (1977) correctly pointed out that, if the two earlier taxa were conspecific, as suggested by Brinkhurst and Jamieson (1971), the name *mobilis* Liang would take precedence. Harman suggested that, in view of the clearly non-overlapping ranges of setal lengths of *W. evelinae* and *W. mobilis*, "further consideration of synonymy was not warranted at this time". Hiltunen and Klemm (1980) preferred the latter name for the North American specimens.

Distribution: U.S.A.

Subfamily Naidinae

Genus *Homochaeta* Bretscher, 1896

Homochaeta raptisae Chapman, 1981 has been transferred to *Amphichaeta* (q.v.) (Brinkhurst and Kathman, 1983).

Genus *Specaria* Sperber, 1939

1. *Specaria fraseri* Brinkhurst, 1978 Fig. 2B
(1978: p. 2170; Fig. 2)

The dorsal setae in this species begin in VI but the hairs are non-serrate; the body is covered with foreign matter. The worm has more dorsal setae than species of *Vejdovskyella*, and so is tentatively assigned to this genus. It differs from *Specaria josinae* in having less distinct needle teeth. A detailed description is required.

Distribution: Canada.

Other *Specaria* information:

Brinkhurst and Kathman (1983) transferred *Vejdovskyella hel* : to this genus.

Genus *Nais* Muller, 1774

1. *Nais magnaseta* Harman, 1973 Fig. 2C
(1973: p. 154; Fig. 1A-C)

This species has unique large needle setae, which have long teeth (like *N. elinguis*) but pectinations between them.

Distribution: Texas, U.S.A.

2. *Nais christinae* Kasprzak, 1973 Fig. 2D
(1973: p. 535; Figs. 1-4)

The needle setae of this species are fairly large and parallel, but not as long as in *N. elinguis*, and yet longer than the *N. communis/variabilis* complex. Kasprzak, however, did not discuss the differences between this and other species, apart from the discussion of the atria of *Nais barbata*.

Distribution: Konin, Poland.

3. *Nais stolci* Hrabe, 1981 Fig. 2E
(1981: p. 44; Plate 6: Figs. 1-6)

The needle setae of this species are bifid. Ventral setae of II through V are thinner than the rest, with the distal teeth at a more acute angle than the lower. The ventral setae of VI on possess distal teeth which are longer than the proximal. Hair setae are very long (145 to 212 um). Giant ventral setae are absent. This brief description is derived from the key provided by Hrabe (1981).

Distribution: C.S.S.R.

Other *Nais* material:

Nais andina Cernosvitov is reported from India by Naidu and Srivastava (1980). *Nais menoni* Naidu was renamed *N. andhrensis* by Naidu and Naidu (1981) as the earlier name was pre-occupied (? *Naidium menoni* Aiyer - otherwise unknown to these authors, and not referred to by Naidu and Naidu). Sokolskaya (1961) stated that *Nais lastochkini* Sokolskaya is a synonym of *N. bretscheri* rather than *N. pardalis* (see Cekanovskaya, 1962).

Giani *et al.* (1982) discussed the status of *Nais iorensis* Patridze, determining that it is a subspecies of *Nais bretscheri*.

Brinkhurst and Kathman (1983) suggested some distinguishing characteristics between *Nais variabilis* and *N. communis*, but subsequent work suggests that even these characters are not totally reliable. *Nais elinguis* may have serrations on the bifid setae according to these authors and Dr. R. Grimm (pers. comm.), adding to the features of this species that differ from the typical condition in the genus, already noted by Sperber (1948).

Genus *Rhopalonais* Dzwillo and Grimm, 1974.

1. *Rhopalonais africana* Dzwillo and Grimm, 1974 Fig. 2F
(1974: p. 88; Figs. 2-5)

This species has club-shaped giant ventral setae in II, and asymmetrically palmate setae with hair setae in the dorsal bundles, which begin in VI. This genus is at least close to *Nais*.

Distribution: Africa.

Genus *Bratislavia* Kosel, 1976

This genus was erected by Kosel (1976) for *Pristina elegans* Finogenova (listed as sp. dub. by Brinkhurst and Jamieson, 1971).

1. *Bratislavia unidentata* (Harman, 1973)
(1978: p. 542; Fig. 1a-d)

This species, originally described as *Pristina unidentata*, was redescribed by Harman and Loden (1978) based upon the identification of a sexually mature specimen, the reexamination of specimens in the collection, and a reevaluation of the generic status of the species. This reaffirmed the presence of this genus in North America.

The dorsal setae in this species begin in II, with needle setae simple-pointed, and hairs non-serrate. The species reproduces asexually by fragmentation, as in *Allonais*. The reproductive system of *B. unidentata* is more closely aligned with that of *Allonais* than that of *Nais*, to which this species was originally attributed.

Distribution: SE U.S.A.

Other *Bratislavia* material:

Timm and Popchenko (1978) reassigned *Naidium bilongata* Chen to *Bratislavia*, and claimed that *Bratislavia palmeni* (= *P. elegans*, = *P. napocencis*), *Bratislavia prosetosa* Liang (= *Allodero prosetosa*) and *Bratislavia bilongata* from the Palaearctic, China and the U.S.A. made up this genus. They provided a key to the three species.

Harman and Loden (1979) rediscovered the presence of *Bratislavia bilongata*, a species which hadn't been collected since its original description. Additional morphological information was provided. In addition, Harman and Loden supported Timm and Popchenko's reassignment (q.v.).

Hrabe (1981) regarded *Pristina napocencis* Pop as a synonym of *Bratislavia elegans*.

Kasprzak (1981) attributed *Naidium palmeni* Munsterjelm to this genus rather than to *Allodero* (see under *Dero*).

Genus *Vejdovskyella* Michaelsen, 1903

There is a suspicion that this genus requires careful revision. Most specimens can be separated into two basic types (*comata, intermedia*), but intermediates have been described, and characteristics such as the giant setae of *V. intermedia* may be missing. North American specimens of *V. comata* exhibit cleft-tipped hair setae, and European specimens should be examined for this characteristic. *Vejdovskyella hellei*, a species omitted from the key to North American Naididae by Hiltunen and Klemm (1980), is currently known from Alaska and British Columbia.

Cekanovskaya (1962, 1981 translation) stated that the dorsal setae of *V. comata* begin in VI. *Vejdovskyella macrochaeta* Lastockin and *V. comata grandisetosa* Finogenova should not be ignored by those wishing to separate *comata/intermedia*. Brinkhurst and Kathman (1983) have clarified the separation of *V. comata* from *V. intermedia*. Much confusion was caused by the absence of ventral setae in V or even IV and V in *V. comata*, and the occasional appearance of giant setae in *both* species - these setae differing in form.

Genus *Piguetiella* Sperber, 1939

1. *Piguetiella michiganensis* Hiltunen, 1967 Fig. 2G
(1967: p. 437; Figs. 2a-b, 25, 26)

This species was inadvertently omitted in Brinkhurst and Jamieson (1971). This species is characterized by bifid setae, dorsal setae from VI, with up to 11 setae in ventral bundles of II. As the presence/absence of hair setae is usually taken to be a generic level characteristic in the Naididae (though not necessarily in the Tubificidae) the generic placement here is

unique in the family. It is possible to consider a relationship between *Uncinais* and *P. michiganensis*. *Uncinais*, however, possesses penial setae and eyes, while *P. michiganensis* posesses spermathecal setae and is eyeless.

Distribution: U.S.A.

Other *Piguetiella* information:

As Strayer (1983) has now found *Piguetiella blanci* in North America, a species which may lack all the otherwise scarce short hair setae, there is some doubt about the indepencence of *P. michiganensis*.

Genus *Haemonais* Bretscher, 1900

Haemonais waldvogeli was first reported from North America by Harman (1975), and is now known to widely distributed in the central and eastern areas of the U.S.A. Present known distribution: Europe, Asia, North America, South America, and ? Africa.

Genus *Dero* Oken, 1815

1. *Dero (Dero) magna* Harman, 1974 Fig. 2H
(1974: p. 23; Fig. 4A-C)

The needle setae in this species are pectinate, and much larger than the setae of *Dero asiatica* and *D. pectinata*. The hair setae are not serrate.

Distribution: Surinam, South America.

2. *Dero (Dero) trifida* Loden, 1979 Fig. 2I
(1979: p. 584; Fig. 1A-F)

The needle setae of this species have a small extra tooth between the primary teeth. Prostates are on the vasa deferentia. The extra tooth is lost in cultured specimens, with the implications of this occurrence discussed. This species is compared with others possessing pectinate setae.

Distribution: SE U.S.A.

3. *Dero (Allodero) floridana* Harman, 1971 Fig. 2J
(1971: p. 225; Figs. 1-2)

This species is a new commensal form from Florida, possessing trifid needle setae and a full complement of dorsal setae (c.f. *Dero (Allodero) hylae*). *Dero (A.) floridana* has been found in the ureters of the toad *Bufo terrestris*. In this paper, Harman reviewed the subgenus *Allodero*. This species was omitted from Hiltunen and Klemm (1980).

Distribution: SE U.S.A.

4. *Dero (Dero) abranchiata* Harman, 1977 Fig. 2K
(1977: p. 488; Fig. 3A-C)

This species possesses caudal fossa, but gills are absent, a step beyond those species with very small gills. Needle setae vary from pectinate to palmate, with a web between the lateral teeth.

Distribution: Louisiana, U.S.A.

5. *Dero (Allodero) hylae* (Goodchild, 1951)
(Harman, 1973: p. 71; Fig. 1)

Harman (1971) reviewed the subgenus *Allodero*, suggesting transferral of *Schmardaella hylae* Goodchild 1951 to *Dero (Allodero) hylae*. Harman (1973) reaffirmed this transfer, providing additional diagnosis of the species. Harman (1973), and Harman and Lawler (1975) have provided new host and distributional information on this species. This species was omitted from Hiltunen and Klemm (1980).

Known hosts: *Hyla versicolor, H. squirella*, and *H. cinerea cinerea*.

Distribution: Louisiana, Mississippi, and Florida, U.S.A.

6. *Dero (Aulophorus) bimagnasetus* Harman, 1974 Fig. 2L
(1974: p. 29; Fig. 5A-E)

This species is characterized by a single giant seta in each bundle of III, and 1 to 2 giant setae in IV with widely divergent strongly developed teeth. These setal phenomena are unique to this species within the genus.

Distribution: Surinam, South America.

7. *Dero (Aulophorus) moghei* Naidu and Srivastava, 1980 Fig. 2M
(1980: p. 267; Figs. 8-10)

This species is characterized by bifid needle setae with short teeth. It is said to differ from *Dero michaelseni* Stephenson (= *Aulophorus furcatus* sensu Brinkhurst and Jamieson, 1971) in the absence of coelomocytes, and different teeth on the needle setae.

Distribution: India.

Other *Dero* material:

Harman (1974) elevated the subspecific "*costatus*" form of *Dero (Aulophorus) schmardai* to specific level (as *Dero (A.) costatus*, originally described by Marcus (1944)) based on material from Surinam. Harman, Loden, and Davis (1979) reported *Dero pectinata* Aiyer from North America. Schmal (1977) recorded *Dero (Aulophorus) flabelliger* from Florida (U.S.A.); it has

since been reported elsewhere in the U.S.A. (Hiltunen and Klemm 1980; Wetzel unpubl.). This same species has been reported from Asia by Radhakrishna and Babu (1977) and Kalpana and Naidu (1979), the latter regarding *Dero (Aulophorus) heptabranchiata* Liang as distinct from *D. (A.) flabelliger*.

Naidu, Kalpana, and Kumar (1981) reported *Dero obtusa* as a new record from the Indian subcontinent.

Loden and Harman (1982) renamed *Dero (Aulophorus) pectinatus* Stephenson as *D. (A.) intermedius*. Since this name also is preoccupied, it will be renamed again soon (Harman, pers. comm.). *Allodero bilongata* (Chen) was listed by Brinkhurst and Jamieson (1971) following a suggestion as to its identity by Liang (1964), a student of the original author. The senior author assumed that Liang had been in contact with Prof. Y. Chen about this matter as he was Chen's student. Harman (1977) noted a slight similarity between *Pristina longisoma* and *bilongata*, but rejected Liang's placement of the latter in *Allodero*. It is worth noting, perhaps, that Brinkhurst and Jamieson (1971) did regard this as a tentative assignment to *Allodero* but gave some credit to the source of the idea. Liang also suggested *Naidium palmeni* Munsterjelm belongs here, but Kasprzak (1981) placed it in *Bratislavia* (q.v.). In addition, Harman and Loden (1979) transferred *bilongata* to *Bratislavia*. The *Dero (Aulophorus) flabelliger* noted from Africa by Brinkhurst (1966) was described by Hrabe (1966) as *Aulophorus ghanensis* Hrabe, and his ? *A. pectinatus* as *A. tridentatus* Hrabe. It is possible that the ? *A. furcatus* of Brinkhurst (1970) also is identifiable as *A. africanus* Hrabe.

Genus *Stephensoniana* Cernosvitov, 1935

1. *Stephensoniana tandyi* Harman, 1975 Fig. 2N
   (1975: p. 1; Fig. 1)

   The body of this species has adhering foreign matter, and lacks setae for a considerable portion of the body posteriorly. The needle setae are bifid and there are fewer setae than in *Stephensoniana trivandrana* (Aiyer).

   Distribution: U.S.A.

Genus *Pristina* Ehrenberg, 1828

1. *Pristina unidentata* Harman, 1973 Fig. 2O
   (1973: p. 161; Fig. 2A-C)

   This species subsequently has been transferred to *Bratislavia* (Harman and Loden, 1979) (q.v.).

2. *Pristina arcaliae* Pop, 1973 Fig. 2P
(1973: p. 79; Fig. 1d-f)

The hair setae of this species are serrate; needle setae possess long, parallel teeth, which are unequal in length. Anterior and posterior ventral setae are similar. No proboscis is present. Pop (1974) added to this description.

Distribution: Romania.

3. *Pristina napocensis* Pop, 1973 Fig. 2Q
(1973: p. 81; Fig. 1g-j)

The hair setae of this species are nonserrate; needle setae have long teeth, equal in length. Anterior and posterior setae differ little from each other. No proboscis is present.

Distribution: Romania.

A detailed consideration of these new and previously described taxa led Pop (1973) to suggest that many so-called species might best be described as subspecies of a much smaller number of distinctive taxa. Hrabe (1981) listed this species as a synonym of *Bratislavia elegans*.

4. *Pristina longisoma* Harman, 1977 Fig. 2R
(1977: p. 485; Fig. 2A-C)

This species is characterized by nonserrate hair setae, sharply pointed needle setae, and the absence of a proboscis. Segments number up to 112, hence the name. The hair setae are elongate in II, as in *Pristina leidyi* It is possible that the animal reproduces by fragmentation, as it does not form fission zones, and forms only 5 rather than 7 segments anteriorly when regenerating. The generic placement may be in doubt according to Harman (1977).

Distribution: SE U.S.A.

Other *Pristina* information:

Material identified from Africa by Brinkhurst (1966) as *Pristina minuta*, *P. synclites*, and *P. foreli* are regarded as *Pristina osborni*, partly *P. synclites*, and *P. aequistea*, respectively, by R. Grimm (pers. comm.).

Harman (1973) considered *Pristina minuta* (Stephenson) as a distinct taxon from *Pristina osborni* Walton, and recorded it from North America.

Harman (1974) recorded *Pristina longidentata* from Surinam, showing that in addition to the serrations on the hair setae, the setae are twice the length of those in *Pristina idrensis*, which it otherwise resembles.

Pristina evelinae Marcus is seen as a synonym of *Pristina aequiseta* by Harman (1974).

Harman and McMahan (1975) elevated *Pristina leidyi* to specific rank, showing it to have finely bifid needles; *Pristina bidentata* was subsequently reduced to a synonym of this pan-american species. The European form would then be *Pristina longiseta*. Grimm (1974) still used the subspecific nomenclature.

Pristina acuminata Liang was described and recorded from North America by Spencer (1978).

Harman, Loden, and Davis (1979) reported *Pristina americana* Cernosvitov from North America, and added a second record of *Pristina synclites* Stephenson.

Loden and Harman (1979) synonymized *Pristina foreli* with *Pristina aequiseta*.

Harman (1982) provided additional information on the distribution of Naididae in Central America. Two species, *Pristina menoni* (Aiyer) and *Dero plumosa* Naidu were reported for the first time from the Western Hemisphere.

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FAMILY TUBIFICIDAE

Subfamily Tubificinae

Genus *Tubifex* Lamark, 1816

This genus has suffered from the inclusion of many forms in which the male ducts bear little resemblance to those of the type species *Tubifex tubifex* (Muller). The recognition of some of the cogeners of many former *Peloscolex* species now grouped into the genus *Tubificoides* Lastockin, 1937 (see Brinkhurst 1981*a*) made up of coastal species, has resolved some problems, but more await a revision by Dr. C. Holmquist who currently is working on this genus (Holmquist, pers. comm.). The distinct form of the atrium and penis, absence of genital setae, and relative positions of the prostate and vas deferens should form a basis for the genus, but use of the length and bipartite nature of the vas deferens as seen in *T. tubifex* as a generic criterion requires very critical evaluation.

1. *Tubifex acapillatus* Finogenova, 1972 Fig. 8B
(1972*a*: p. 1883; Pl. 1, Fig. II; Pl. 2, Figs. I-IV)

The vas deferens is said to be very long, but the species lacks genital setae and has very long penis sheaths in small penial sacs.

Distribution: Caspian Sea.

While Hrabe (1982) put *acapillatus* in *Isochaetides* largely because of the absence of both hair and pectinate setae, Brinkhurst (1984) indicated its close relationship with the *T. kessleri* complex.

2. *Tubifex harmani* Loden, 1979 Fig. 3G
(1979: p. 601; Fig. 1A-E).

Hair and pectinate setae are present, and the posterior ventral setae are strongly curved with enlarged lower teeth. The male ducts are short and cylindrical, the atria only a maximim of twice the breadth of the vasa deferentia, but two-thirds their length. The species usually reproduces asexually, but mature specimens are well described. Spermatozeugma are present, in contrast to the genus *Sketodrilus* Karaman, erected for the former *Tubifex* species *T. flabellisetosus* Hrabe, which appears to possess very similar male ducts (see Fig. 6A). The latter, though, are said to possess simple sperm bundles in the spermathecae and the genus is, therefore, attributed to the Aulodrilinae by Karaman (1976) despite the absence of other characteristics and the presence of tubificine characters. The form of sperm should be checked in both taxa. It should be noted that species of *Aulodrilus* frequently reproduce asexually. Although Brinkhurst advised Loden that *T. harmani* might be an *Isochaetides*, that position can no longer be supported by virtue of a recent reconsideration of that genus (Brinkhurst 1981*a*, and below). The species may be aligned with other

current *Tubifex* species such as *T. montanus* Kowalewski, *T. kessleri* Hrabe, and *T. superiorensis* (Brinkhurst), which have short male ducts and long penis sheaths in contrast to typical *Tubifex*.

Distribution: U.S.A.: Louisiana and Florida;
Canada: British Columbia.

3. *Tubifex hrabei* Sokolskaya, 1973 Fig. 3A
(1973: p. 58; Figs. 3-4)

This asiatic (U.S.S.R.) species has hair and pectinate setae like those of *Tubifex nerthus*. The vasa deferentia are long, twice the atrial length of about 500um. The penis sheaths are funnel-shaped, with a narrow "spout" and reflected "funnel", unlike those of typical *Tubifex*. It may be associated with the *T. kessleri* group.

Distribution: Kamchatka, U.S.S.R.

4. *Tubifex hubsugulensis* Semernoi and Akinshina, 1980 Fig. 8C
(1980: p. 123; Fig. 2)

Dorsal bundles with 2 to 3 hair setae, 3 to 4 pectinates with long lateral teeth; in median segments the hairs are accompanied by bifids. The ventral setae are 4 to 6 per bundle, with upper teeth somewhat longer than the lower, and with penial and spermathecal setae thin and hollow-tipped. The atria are short and broad, without ejaculatory ducts, and with large penes without sheaths. The generic position of this species is questionable. Few genera other than *Haber* have both spermathecal and penial setae. The species was listed earlier as a nomen nudum (Semernoi and Tomilov, 1972; Semernoi, 1973).

Distribution: Lake Khubsugul, U.S.S.R.

5. *Tubifex intermedius* Semernoi, 1973
(1973: p. 9)

This represents another nomen nudum - a species with naked cone-shaped penes, vas deferens three times the length of the atrium, and spermathecal pores in X/XI.

Distribution: Transbaikal lakes, U.S.S.R.

6. *Tubifex litoralis* Erseus, 1976
(1976: p. 6; Figs. 1-4)

A *Tubifex* species very similar to the rare "blanchardi" form of *T. tubifex*, both being known from salt water or areas of high conductivity (as for example, in France (Giani and Martinez-Ansemil, 1981a), and in Sahara pools

(Brinkhurst, unpublished)). The positions of the prostate glands differ according to Erseus (1976).

Distribution: Iceland.

7. *Tubifex maritimus* Hrabe, 1973
(1973: p. 34; Figs. 5-6)

A Black Sea species with hair setae and bifids posteriorly from XV. This species was transferred to *Tubificoides* by Brinkhurst and Baker (1979).

8. *Tubifex newfei* Pickavance and Cook, 1971
(1971: p. 249; Fig. 1A-C)

This species is supposedly synonymous with *Tubifex nerthus* Michaelsen (Brinkhurst and Baker, 1979).

9. *Tubifex pomoricus* Timm 1978 (*In* Timm and Popchenko, 1978)
(1978: p. 85; Fig. 4)

Specimens are known from a weakly saline river in the Murmansk region, U.S.S.R., whose setae resemble those of *Tubifex nerthus* even to the inclusion of penial setae. These are unmodified here, just as the author believed they usually are in *T. nerthus*, although the original description cited simple-pointed penials. Timm and Popchenko believed this to be a parthenogenetic species as their specimens lacked male ducts. Even if these forms were parthenogenetic, they need not necessarily be specifically separable from *T. nerthus*.

Distribution: Murmansk region, U.S.S.R.

10. *Tubifex postcapillatus* Cook, 1974
(1974: p. 127; Fig. 1)

Brinkhurst and Baker (1979) placed this species in the genus *Tubificoides*.

Distribution: U.S.A./Mexico - Baja, California.

11. *Tubifex solitarius* Semernoi, 1972 Fig. 3F
(1972: p. 20; Figs. A-C)

This is a species with hair and pectinate setae, and fairly short male ducts with atria not much wider than the rest. The penes are protrusible and bear terminal cuticular sheaths. This may prove to belong to the same assemblage as *Tubifex harmani* (q.v.).

Distribution: Gusino - Ubukun Lakes, U.S.S.R.

12. *Tubifex bazikalovae* Cekanovskaya, 1975 (1975: p. 121; Fig. 4A-C) Fig. 3E

Hair setae begin in VII (rarely in V) as do pectinates; all setae in II to V or VII are bifid. There are no genital setae. The male ducts are of the *Tubifex* type. The cuticular penis sheath is said to be of characteristic form, which seems to be a short truncated cone as illustrated. The spermatozeugmata are short.

Distribution: Lake Baikal, U.S.S.R.
depth: 328 to 1300m.

13. *Tubifex taediosus* Cekanovskaya, 1975 (1975: p. 123; Fig. 5A-C) Fig. 3B

Hair setae present, short; pectinates with few short intermediate teeth, distal tooth usually mych longer than proximal, but variable; anterior ventrals again with very long upper teeth. While the vasa deferentia are quite long, they enter the atria apically, with the prostate attached to the posterior surface of the atria; penis sheaths are cylindrical. The male pores are lateral in position.

Distribution: Lake Baikal, U.S.S.R.
depth: 600 to 1460m.

14. *Tubifex minutus* Cekanovskaya, 1975 (1975: p. 125; Fig. 6A-C) Fig. 3C

Very long species, with hair setae only in II through VI, missing posteriorly; pectinates from II to posterior end. Ventral setae of X with very shortened teeth. The penes lack sheaths, and the atria are not of characteristic *Tubifex* shape *(sensu strictu)*. The species is compared to *Tubifex newfei* (= *T. nerthus*), to which it bears very little resemblance, but to no other tubificid. It does not appear to be a *Tubifex*.

Distribution: Lake Baikal, U.S.S.R.

Species transferred out of the genus *Tubifex*:

Tubifex longipenis Brinkhurst and *Tubifex pseudogaster* (Dahl) as well as *Tubifex maritimus* Hrabe and *Tubifex postcapillatus* Cook are now located in *Tubificoides* Lastockin (Brinkhurst and Baker, 1979). *Tubifex flabellisetosus* Hrabe was made the type species of *Sketodrilus* by Karaman (1976) - see *Tubifex harmani* (above).

Species transferred into the genus *Tubifex*:

On the break-up of *Peloscolex*, all of the species could be located, apart from a few *species dubia* (see below). Only *P. superiorensis* Brinkhurst and Cook had to be temporarily assigned to *Tubifex* pending a restructuring of that genus - it will be aligned with *montanus-kessleri* assemblage if that becomes separated from *Tubifex* s.s.

Finogenova (1972*b*) tranferred *Ilyodrilus svirenkoi* Lastockin to this genus and redescribed it. She compared it with *Tubifex speciosus* Hrabe, declaring that these two taxa were distinct among *Tubifex* species, having both spermathecal and penial setae as well as different penes to those of other species. These two species have since been transferred to *Haber* by Brinkhurst (1981*a*).

Species in other genera related to *Tubifex* species:

Limnodrilus infundibuliferus Isossimov, 1972
(1972: p. 35)

This Lake Baikal species is related to *Tubifex kessleri* Hrabe, but neither may be correctly placed in the genus, being more likely to be part of the *montanus-superiorensis* group of species, with long penis sheaths, narrow atria, and relatively short vasa deferentia in comparison with *Tubifex tubifex*. Material in the hands of Isossimov and R. O. Brinkhurst from Lake Baikal suggests a number of related species exist (T. Timm, pers. comm.). See section on Lake Baikal species for further information and discussion.

Distribution: Lake Baikal, U.S.S.R.

Other *Tubifex* information:

The rare *Tubifex bergi* was redescribed by Poddubnaja (1980) as a distinct species co-existing with *Tubifex tubifex* in the type locality, Lake Issyk-Kul. Brinkhurst (1971*a*) postulated that this was no more than one of three "forms" of *T. tubifex*, with the typical form possessing dorsal hair and pectinate setae, the *"blanchardi"* form lacking them completely, and the *"bergi"* form as the rarer intermediate condition. The *"blanchardi"* form has been reported from several localities with high salinity levels (see *Tubifex litoralis* above). The atria of *Tubifex newaensis* are discussed under *Isochaetides* (below). Laakso (1969) re-described *T. smirnovi* (Fig. 3H). Hrabe (1981) illustrated the penes of *Tubifex costatus* (Fig. 3D).

Species inquirende:

Tubifex acapillatus, T. hubsuglensis, T. intermedius, T. kryptus, T. minutus, T. pomoricus, and *T. smirnovi.*

Genus *Limnodrilus* Claparede, 1862

Once it is recognized that genera like *Potamothrix* may contain species with hair setae and others with only bifid setae, the early tendency to include all tubificine species with bifid setae in *Limnodrilus* can be ignored. The male ducts are characteristically elongate, the cuticular penis sheaths elaborately developed, usually surrounded by penial sacs with spiral muscles. While the genus is usually easy to recognize, the species are hard to separate in some instances. In areas such as the St. Lawrence Great Lakes, a variety of intermediate forms are recognized that blur species limits. Partially mature forms may be misidentified, and confirmation should be based on mated specimens.

1. *Limnodrilus bulbiphallus* Block and Goodnight, 1972 Fig. 3M
(1972: p. 580; Figs. 1-5)

This Central American species resembles *Limnodrilus hoffmeisteri*, but there is a characteristic bulge at the head of the penis sheath.

Distribution: Belize River, British Honduras.

2. *Limnodrilus psammophilus* Loden, 1977 Fig. 3N
(1977: p.322; Figs. 1-4)

The penis sheaths in this species are short, broad basally, but not spade-shaped as in *Limnodrilus silvani* and *L. grandisetosus*.

Distribution: Tennessee and Louisiana, U.S.A.

3. *Limnodrilus rubripenis* Loden, 1977 Fig. 3O
(1977: p. 324; Figs. 5-8)

The penis sheaths are reddish-brown in the type series, and are shaped something like those of *Limnodrilus angustipenis* but with less pronounced basal flaring. The heads of the penes have two flat tapered projections. Enlarged ventral setae are present in IV or V to IX.

Distribution: Louisiana and Illinois, U.S.A. (Wetzel, 1980).

4. *Limnodrilus variesetosus* Brinkhurst, 1979 Fig. 3P
(1979*a*: p. 42; Fig. 1A-G)

This species is distinguished from others in the genus by the variability of the setae. Setae in the ventral bundles are larger with longer distal teeth than those in the dorsal bundles. This may be only a variant of *Limnodrilus udekemianus*.

Distribution: Jamaica.

Other *Limnodrilus* information:

Loden (1977) showed that *Limnodrilus silvani* and *L. grandisetosus* are distinct species, an opinion this senior author can now verify from examination of new material from Oregon, U.S.A., and Japan in co-operation with Dr. A. Ohtaka, who is preparing a detailed account of these related species.

For *Limnodrilus infundibuliferus* Isossimov see *Tubifex* (above). *Limnodrilus neotropicus* Cernosvitov was transferred to *Isochaetides* by Hrabe, but this move was not accepted by Brinkhurst (1981*a*). Attempts to obtain new material of this South American species have so far been unsuccessful, but must be obtained to settle the generic placement as the characteristic spiral penial muscles have not been observed.

Genus *Isochaeta* Pointner, 1911

This genus is restricted to the doubtful *Isochaeta virulenta* Pointner, considered to be an immature specimen of *Limnodrilus udekemianus* by Brinkhurst (1981*a*) following recognition of *Isochaetides* Hrabe and *Varichaetadrilus* Brinkhurst (q.v.).

Genus *Isochaetides* Hrabe, 1966

This name has been preferred to the use of *Isochaeta* by east European biologists due to the doubts about the validity of the latter. Brinkhurst (1981) acceeded to this view, but preferred to exclude *Tubifex newaensis* (see *Tubifex*), *Tubifex pseudogaster* (see *Tubificoides*), *Limnodrilus neotropicus* (see *Limnodrilus*), *Limnodrilus lastockini* (see *Psammoryctides*), and *T. dojranensis* (see *Haber*). *Isochaetides hamatus* and *I. curvisetosus* may be synonymous. *Isochaetides tomilovi* and *I. koshovi* are mentioned by Semernoi and Tomilov (1972) and by Semernoi (1973), but the former was described by Semernoi and Akinshina (1980), see below.

The male ducts of the type species *Isochaetides baicalensis* are illustrated here (Fig. 8G) from new material from Lake Baikal, donated by Dr. O. Pfannkuche. The identity of this new material was confirmed by Drs. Semernoi and Timm (pers. comm.), who indicated that the spermathecal setae are unusually small. This could account for a problem that arose with the type specimens supposedly of *Clitellio korotneffi* Michaelsen examined by Brinkhurst (1981*b*). A jar of Lake Baikal worms bearing the appropriate numbers contained worms with tubificine characteristics which seemed closest to *Tubifex newaensis*. This species does not occur in Lake Baikal, however, and thus the suggestion is that this material was even more muddled than proved to be the case elsewhere. The spermathecal setae could easily have been overlooked in the brief examination of specimens in Hamburg. The resemblance of the atria of *Isochaetides baicalensis* to those of *Tubifex newaensis* perhaps lends a bit more credence to the Soviet insistance on the placing of both these taxa in *Isochaetides*, but this is still based largely on the setal plan, as the male ducts of genuine *T. newaensis* very closely resemble those of *T. tubifex*.

1. *Isochaetides tomilovi* Semernoi and Akinshina, 1980 Fig. 8F
(1980: p. 125; Fig. 3)

Setae all bifid; blunt teeth subequal; up to 8 setae per bundle anteriorly. The vasa deferentia are elongate, the atria tubular and somewhat curved over the median prostates. Ejaculatory ducts are absent. Long penes are present in deep penis sacs. There are no cuticular penis sheaths or genital setae.

Distribution: Lake Khubsugul, U.S.S.R.

The generic position of this species is doubtful, as is the one other species found in Lake Khubsugul, described as *Tubifex hubsugulensis* (q.v.).

Genus *Varichaetadrilus* Brinkhurst and Kathman, 1983
(1983: p. 301)

This genus, originally named *Varichaeta* by Brinkhurst (1981*a*), was erected from the previous *Isochaeta* species *I. nevadana* and *I. israelis* together with the second North American species of *Varichaeta pacifica*. A fourth species, *Varichaetadrilus fulleri*, also was found in the U.S.A., and was described when the pre-occupied original name was modified (Brinkhurst and Kathman, 1983). Species may or may not have hair and pectinate setae dorsally. While the male ducts are as elongate as they are in *Isochaetides*, the atria are much longer than the vasa deferentia rather than the reverse.

1. *Varichaetadrilus pacificus* (Brinkhurst, 1981) Fig. 8E
(1981*a*: p. 304; Fig. 2)

This type species usually has a large number of hair and pectinate setae dorsally in anterior bundles, but another form has nearly all bifid setae. The penes are erectile, with small cuticular sheaths on the tips. Slightly modified penial setae are present.

Distribution: Alaska to Oregon, U.S.A.

Psammoryctides minutus needs to be compared closely to *V. pacificus*, at the very least it should be located in this genus.

2. *Varichaetadrilus fulleri* Brinkhurst and Kathman, 1983 Fig. 8D
(1983: p. 302; Fig. 1)

This large species has only bifid setae: 2 to 3 (5) anteriorly, 1 to 2 posteriorly; the most anterior setae with distal teeth shorter than the proximal, then distal teeth longer than proximal in most preclitellar bundles. Posterior setae with distal teeth shorter and thinner than proximal. Genital setae absent. Large erectile penes present, with small distal cuticular penis sheaths. Male ducts are characteristically elongate.

Distribution: Kentucky and Mississippi, U.S.A.

Genus *Psammoryctides* Hrabe, 1964

Four species in the genus *Psammoryctides* have been described since 1971; three from Europe, and one from North America. Loden (1978) defined the subgenus *Spencerius*, including in it all species of *Psammoryctides* endemic to North America. The European *Psammoryctides barbatus* has now been reported from the St. Lawrence River in Canada (Vincent *et al.*, 1978).

1. *Psammoryctides stankoi* Karaman, 1974 Fig. 5E
(1974*a*: p. 5; Figs. 1-8)

This taxon is now considered species inquirende.

Hair and pectinate setae are present anteriorly - the pectinates of posterior dorsal and ventral bundles are clearly artifacts due to attached filamentous bacteria and/or other microbiota. There are no genital setae. The species appears to be at least related to *Psammoryctides deserticola*.

Distribution: Serbia (Yugoslavia).

2. *Psammoryctides hrabei* Karaman, 1971 Fig. 5F
(1971: p. 384; Figs. 1-8)

This species differs from *Psammoryctides barbatus* is size, segment and setal number, and absence of genital setae. A more detailed comparison is required to establish the species.

Distribution: Macedonia, Yugoslavia.

3. *Psammoryctides hadzii* Karaman, 1974 Fig. 5D
(1974*b*: p. 223; Figs. 2, 2a)

This species is close to *P. ochridanus* but is said to be shorter, with fewer segments, shorter hair setae, spermathecal setae and ventral setae. Some setal bundles of *P. hadzii* possess more setae than those of *P. ochridanus*. Since this species does not possess *Psammoryctides* male ducts, it should be considered incertae cedis. Further diagnosis may suggest its transferral to the genus *Tubifex* (see also *Varichaetadrilus*).

Distribution: Cave of Planina, part of an underground system of the River Pivka in Slovenia Yugoslavia.

4. *Psammoryctides convolutus* Loden, 1978 Fig. 5C
(1978: p. 78; Fig. 3A-G)

This species has spermathecal setae, and enlarged posterior ventral setae in contrast to other American species (Loden, 1978).

Distribution: Southeastern U.S.A., Mexico.

Other *Psammoryctides* information:

Psammoryctides lastockini (Jaroschenko) is now regarded as a subspecies of *Psammoryctides deserticola* by Finogenova (1972*b*), as suggested by Brinkhurst (1971*a*).

Psammoryctides californianus is now known from Illinois, U.S.A. (Wetzel, 1980).

Psammoryctides curvisetosus, recently recombined by Loden (1978), is now located in *Isochaetides* (see above).

Loden (1978) and Hrabe (1981) illustrated male ducts of *Psammoryctides* (Figs. 5A and 5B, and 5G through 5J, respectively).

Psammoryctides minutus needs to be re-assigned to *Varichaetadrilus*.

Species considered incertae sedis: *Psammoryctides hadzii*.

Genus *Potamothrix* Vejdovsky and Mrazek, 1902

This genus is well defined, although a number of species are hard to define, especially those of the Ponto-Caspian region.

1. *Potamothrix alatus* Finogenova, 1972 Fig. 8H
(1972*b*: p. 104; Figs. 21-24)

This species is characterized by the presence of hair and pectinate setae. Spermathecal setae of *P. alatus* are very slender but straight-tipped, not bent as in *P. heuscheri* (Finogenova, 1972*b*). This species also has prostate glands, with characteristic wing-like extensions around X/XI. This species is compared with *Potamothrix hammoniensis* and *P. heuscheri* by the author; the description is brief, with distinction from *P. hammoniensis* not profound.

Distribution: Dnieper/Bug Firth, Black Sea.

2. *Potamothrix cekanovskajae* Finogenova, 1972
(1972*a*: p. 1882; Pl. 1, Fig. I)

This species is characterized by exclusively bifid setae, and the absence of both genital setae and a prostate gland. It is compared with *Potamothrix moldaviensis* and *P. grimmi* by the author (species which were synonymized by Brinkhurst, 1971). *Potamothrix cekanovskajae* differs from *Potamothrix caspicus* in the lack of a prostate (a character which may could easily have benn overlooked in light of the prostate system in this genus). Finogenova (1972*b*) synonymized *Limnodriloides dniprobugensis* Jaroschenko with *P. caspicus*, but did not compare it with *P. cekanovskajae*.

Distribution: Caspian Sea.

3. *Potamothrix manus* Finogenova, 1976
(1976: p. 1565; Pl. VIII)

This species is characterized by exclusively bifid setae, spermathecal setae as in *Potamothrix hammoniensis*, and the absence of prostate glands. This species also lacks the slightly modified penial setae as in *P. moldaviensis* and *P. grimmi*, and (according to Finogenova, 1976) differs in the form of the somatic setae and the body length. Setal form variation in *P. moldaviensis* was discussed by Brinkhurst (1971).

Distribution: Caspian Sea.

4. *Potamothrix postojnae* Karaman, 1974 Fig. 4G
(1974*b*: p. 226; Figs. 5, 5a)

Hair and pectinate setae are present. The most distinguishing characteristic of this species is the lack of spermathecal setae, separating it from all other known *Potamothrix* species. Hair and pectinate setae are present. This negative characteristic is the major difference between this and other known species.

Distribution: Cave of Planina, an underground system of the River Pivka in Slovenia, Yugoslavia.

Other *Potamothrix* information:

Pop (1971) described *Potamothrix moldaviensis minimus*, and (1976) defended the separation of *Potamothrix thermalis* from *Potamothrix heusheri*, basically by the differences in spermathecal setae. Reference is made to the separation of *Potamothrix bedoti* from *Potamothrix bavaricus* by Timm (1970), which was independently confirmed by Spencer (1978). Hrabe (1969) identified *Potamothrix thermalis* and showed it to be similar to *Potamothrix svirenkoi* (Lastockin). The spermathecal setae of these *Potamothrix* species are illustrated in Figs. 4H through 4L. Baker (1982) redescribed the penial structure of *P. hammoniensis*.

While a current list of species in the genus *Potamothrix* would thus far include *Potamothrix moldaviensis* Vejdovsky and Mrazek - type, *P. bavaricus*, *P. bedoti*, *P. caspicus*, *P. hammoniensis*, *P. heuscheri*, *P. isochaetus*, *P. ochridanus*, *P. prespaensis*, and *P. vejdovskyi*, several of these may be further confused by the above descriptions. A critical revision of the genus is needed, with detailed examination of the rarer and recently described species. Intraspecific variation needs to be established in regard to prostates and genital setae, as do the effects of environment on setal form. Specific limits are quite confused in material outside western Europe and North America.

Genus *Antipodrilus* Brinkhurst, 1971

1. *Antipodrilus timmsi* Brinkhurst, 1971 (1971*b*: p. 112; Fig. 2C) Fig. 4C

This species is characterized by hair and pectinate setae dorsally, and ventral setae with long distal teeth in the anterior bundles. The spermathecal setae have blade-like tips.

Distribution: Australia.

2. *Antipodrilus plectilus* Brinkhurst and Fulton, 1979 (1979: p. 2; Figs. 1-5) Fig. 4D

This species lacks hairs and pectinates, but has fewer setae of a different form than those of *A. multiseta*. Spermathecal setae are present. The ejaculatory ducts of this species are moderately long.

Distribution: Tasmania and Australia.

3. *Antipodrilus multiseta* Brinkhurst and Fulton, 1979 (1979: p. 2; Figs. 6-8) Fig. 4E

These large worms are characterized by 12 to 15 bifid setae anteriorly, and thin, hollow-tipped spermathecal setae. The ejaculatory ducts are thin.

Distribution: Australia.

Genus *Peloscolex* and other associated taxa:

The recent history of this genus is complex, and it is simpler to refer the reader to the recent literature than to attempt to review all the activity in detail. The major debate revolves around the type species, a taxon described very briefly by Leidy (1851). Only when the family was being revised did it become apparent that this type species of the genus had never been identified since that initial discovery. The appearance of material that seemed to be identifiable as the type species led to its re-description by Brinkhurst (1962), and thus the genus was put on a firmer basis than before, although many species were not fully described. Holmquist (1978, 1979) decided that the type species was not identifiable with the material available to Brinkhurst, even though specimens of that taxon were known to occupy habitats closely resembling those in which it was first described in the Philadelphia area. If the situation had remained like this, the genus would have again been based on a very old, unconfirmed description. However, Holmquist created a problem for North American biologists by suggesting that Leidy had before him the much better-known species, which were later described under the name *Peloscolex multisetosus*.

Thus the name *variegatus* would be separated from the taxon known under that name since 1962, and attached to the taxon known since 1900 as *multisetosus*! While defending the original selection of the neotype of *variegatus* (as described by Brinkhurst, 1979*b*), it seemed best to decide that the original Leidy description is so brief as to be indeterminable, and so the various species were grouped by Brinkhurst (1981*a*) as follows:
Genus *Peloscolex* Leidy, 1851

Peloscolex variegatus Leidy - sp. dub.

Other dubius species: *P. arganoi, P. boitanii, P. chukotensis, P. cottarellii, P. debilis, P. malevici, P. marinus,* and *P. pigueti.*

Genus *Spirosperma* Eisen, 1879

Spirosperma ferox Eisen - type

Other species in this genus include: *S. apapillatus, S. beetoni, S. carolinensis, S. nikolskyi, S. stankovici, S. tenuis,* and *S. velutinus.*

Genus *Quistadrilus* Brinkhurst, 1981
(1981*a*: p. 1060)

Quistadrilus multisetosus (Smith) - type

Peloscolex moszynskii, a species described by Kasprzak (1971) and re-described by Juget and Lafont (1979), is apparently synonymous with *P. multisetosus* (Brinkhurst, 1981*a*).

Genus *Baikalodrilus* Holmquist, 1978
(1978: p. 206)

Baikalodrilus kozovi (Hrabe) - type

1. *Baikalodrilus digitatus* Holmquist, 1979
(1979: p. 50; Figs. 16B-D, 17)

Distribution: Lake Baikal, U.S.S.R.

Specimens identified by Soviet biologists as *Peloscolex (= Baikalodrilus) werestschagini* Michaelsen were described as a separate species by Holmquist (1979), and as *P. werestschagini* sensu Okuneva (Holmquist, 1978). This new species has long digitate papillae not seen in the single specimen available to Michaelsen. The types of *P. werestschagini* are lost, apart from a fragment

that reveals nothing new. Holmquist (1979) claimed that the male ducts of the two forms differ. Both are restricted to Lake Baikal. This problem will not be resolved until and unless new material of *P. werestschagini* is obtained. Brinkhurst (1984) discussed this genus at length.

Genus *Haber* Holmquist, 1978
(1978: p. 206)

Haber speciosus (Hrabe) - type

The following species in this genus are very difficult to separate, and may not all survive a detailed revision: *Haber amurensis, H. dojranensis, H. monfalconensis, H. simsi,* and *H. zavreli,* plus the recently emended *H. pyrenaicus* (Juget and Giani, 1974), and *H. turquini* (Juget and Lafont, 1979) (Brinkhurst, 1981*a*).

Finogenova (1972*b*) showed that *Ilyodrilus svirenkoi* Lastockin is related to *Haber speciosus* (then thought to be a *Tubifex* species), so it belongs here (see Fig. 4A). Hrabe (1982) regarded *Haber zavreli* as a subspecies of *H. speciosus* in the genus *Tubifex.* Giani and Martinez-Ansemil (1981*a*) described a taxon as *Peloscolex* sp., which appears to belong here.

Genus *Tubificoides* Lastockin, 1937

Tubificoides heterochaetus Lastockin - type

A large number of species formerly classified as *Peloscolex, Tubifex,* or *Limnodrilus* species now belong in this marine genus, along with a series of species to be described by Drs. H. R. Baker and C. Erseus (pers. comm.). The North American specimens attributed to the species *T. gabriellae* have now been recognized as belonging to a variety of other species. *Tubificoides gabriellae,* a South American species, has been transferred out of this genus into *Tectidrilus* (Erseus, 1982).

Since these recent accounts, the following species have been described or noted by the authors:

1. *Peloscolex pescei* Dumnicka, 1980 Fig. 8I
(1980: p. 663; Figs. 1-2)

Hair and pectinate setae are present in this papillate species. Ventral setae are simple-pointed in II and III, with enlarged, hooked simple-pointed setae in IV to VI, but bifid in other ventral bundles. Penis sheaths are present; modified genital setae are not developed.

Distribution: a well in Marche, Italy.

This species falls neatly between the two subgenera of the genus *Spirosperma* (discussed in Brinkhurst, 1981*a*):

Spirosperma (Spirosperma) - pectinate setae and penis sheaths present; genital setae and simple-pointed ventral setae are absent.

Spirosperma (Embolocephalus) - pectinate or bifid setae very hair-like; penis sheaths absent; spermathecal setae present; simple-pointed ventral setae present anteriorly.

2. *Peloscolex malevici* Cekanovskaya, 1975
(1975: p. 128-129; Figs. 7A-7B)

This papillate worm possesses thin, needle-like dorsal setae in combination with serrate hair setae. Ventral setae are large, simple-pointed, and are very large posterior of the clitellum. Genital setae are absent; Spermathecae are globular, with ducts as long as the ampullae. Vas deferens are about three times the length of the atria, which they enter apically. Prostates enter atria just above the mid-point. The atria contain crystalline formations. Penes are small, without cuticular sheaths, and in deep penial sacs. The generic position of this species cannot be determined because of the recent division of *Peloscolex* into several genera. The specialized large papillae of this species may resemble those of *Quistadrilus multisetosus* or *Spirosperma stankovici*. It also could be a *Telmatodrilus (Alexandrovia)* (see also Lake Baikal section, where redescription is noted).

Distribution: Lake Baikal, U.S.S.R.
depth: 470-1450m.

3. *Peloscolex coiree* Medeiros and Neves, 1982 Fig. 8J
(1982: p. 177; Fig. 1)

There are 2-4 hair setae, 2-4 pectinate setae in the dorsal anterior bundles, and in the median bundles the pectinates have few intermediate teeth. The distal teeth of the ventral setae are longer and thinner than the proximal, with a small intermediate tooth in some instances (anterior 2-6, reducing to 1 posteriorly). The vas deferens enters the short atrium apically, just above the large prostate. There is no ejaculatory duct. Penial sheaths and genital stae are absent.

Distribution: Bonaire, Netherlands Antilles.
(fresh and brackish water).

The authors (Madeiros and Neves, 1982) considered this species to be related possibly to *Peloscolex superiorensis* Brinkhurst and Cook, now located in *Tubifex* (q.v.), but the generic position of this new species must remain in doubt until more details are available. This species should be compared with *Peloscolex malevici* (see above).

It should be noted that this arrangement differs from that proposed by Holmquist (1978, 1979) in several aspects: *Spirosperma* of Brinkhurst includes *Embolocephalus* Randolph and *Orientodrilus* Holmquist of Holmquist, the former being regarded as a subgenus of *Spirosperma*. *Peloscolex* sensu Holmquist has become *Quistadrilus*. *Baikalodrilus* Holmquist, *Haber* Holmquist, and *Tubificoides* Lastockin emend. Holmquist are accepted by Brinkhurst, although emended. *Edukemius* Holmquist was regarded as a subgenus of *Tubificoides* by Brinkhurst, although with less justification than in the case of *Embolocephalus*.

Genus *Ilyodrilus* Eisen, 1879

In this genus there seem to be problems in recognizing the type species *Ilyodrilus perrieri*, and the similar *Ilyodrilus fragilis*, neither of which have been confirmed since their original description over a century ago. The more recent species *Ilyodrilus templetoni* and *Ilycdrilus frantzi* are the only firmly established taxa. *Ilyodrilus orientalis* Sokolskaya was re-named *Ilyodrilus sokolskayae* by Brinkhurst (1970) due to the preoccupation of the former name.

1. *Ilyodrilus mastix* Brinkhurst, 1978 Fig. 4F
(1978: p. 2171; Fig. 3)

This species is likely to be placed in a distinct genus at some future date; its present placement is a mater of convenience. The species has a short, thick-walled atrium with a capping prostate. The thin vas deferens is intimately associated with the ovary. The dorsal setal bundles are a combination of bifid and hair setae rather than pectinates. There appears to be an absence of both spermathecae and penial sheaths in this species.

Distribution: NW North America.

Other *Ilyodrilus* information:

New specimens of *Ilyodrilus frantzi* were found with *I. mastix* in the Fraser River, B. C., Canada (Brinkhurst, 1978). These specimens possessed hair setae located more anteriorly than those specimens previously seen. Some of these new specimens possessed pectinate setae.

Genera *Peipsidrilus* Timm, 1977, and *Umbadrilus* Timm, 1978.

These genera have been united into *Peipsidrilus* by Dr. N. Finogenova (1982) following a re-appraisal of the prostate glands.

Peipsidrilus pusillus Timm, 1977 Fig. 4Q
(1977: p. 279; Figs. 1-2)

This is a small species, with up to 6 bifid setae per bundle, and spermathecal setae of tubificine form. The penes have characteristically shaped sheaths. The spermathecae lack spermatozeugmata (?in post copulatory worms), which are present in tubificines. There are no pronounced coelomocytes. Prostate glands have recently been observed on the simple atria (Hrabe, 1981).

Distribution: Lake Peipus-Pskov, Estonia.

Umbadrilus saamicus Timm 1978 (*In* Timm and Popchenko, 1978) Fig. 4R
(1978: p. 87; Figs. 5-6)

This is a small species in which the genital pores are sometimes located on VIII/IX instead of X/XI. The dorsal setae consist of hairs and pectinates. Genital setae are lacking. The vasa deferentia area at least twice as long as the atria; large prostates enter medially. The so-called penis sheaths are internal and would appear to resemble the thickened basal membranes of the penes in *Haber*, also originally mistaken for true penis sheaths in that species. The spermathecae are said to contain masses of thread-like sperm, or an amorphous secretion, but not the spermatozeugmata that would be anticipated with the other tubificine characteristics. Indeed, the periodic absence of spermathecae, together with the forward placement of the reproductive organs, probably indicates a predominantly asexual reproductive habit. The absence of spermatozeugmata may therefore be insignificant.

Distribution: Kola Peninsula, U.S.S.R.

Genus *Tubificidarum* Karaman, 1973
(1973: p. 354)

Karaman (1973) mistakenly attributed a reference to an unknown tubificid by Hrabe (1958) as being a new generic designation under this name. He attributed new material from the type locality (Scutari Lake - Skadarsee) as *Tubificidarum hrabei*, but this will require re-examination before it can be attributed to any subfamily. There is a solid prostate and a naked penis in this species. Atria are wide with very short vasa deferentia. Spermathecae are absent. This description could be based on partially mature material (207 of 217 specimens examined were immature).

Distribution: Yugoslavia.

Genus *Arctodrilus* Brinkhurst and Kathman, 1983

1. *Arctodrilus wulikensis* Brinkhurst and Kathman, 1983 Fig. 8M
(1983: p. 408; Fig. 1)

This species has hair and pectinate setae, thin penis sheaths, but lacks genital setae. The male ducts resemble those of *Limnodrilus*, though the vasa deferentia are not as long nor the penes as modified as in that genus. The male ducts of this species are similar to those of *Psammoryctides hadzii* Karaman (q.v.).

Distribution: Brooks Range, Alaska, U.S.A.

Subfamily Aulodrilinae

This subfamily was erroneously claimed as newly instated in Brinkhurst and Jamieson (1971) but was actually mentioned by Hrabe (1967) in a footnote. The division was being actively debated at the time. Erseus (1982) separated *Limnodriloides* and related marine taxa as a discrete subfamily. This action leaves the position of the sole remaining genus *Aulodrilus* in some doubt. The prostate glands of species in this genus need careful re-examination, as they have previously been illustrated as stalked in a manner resembling Tubificina. The sperm in the spermathecae are bundled but not in the form of spermatozeugmata, as they are in the Tubificina. Asexual reproduction is frequent in this genus, and may cause secondary loss of spermatozeugmata (see *Peipsidrilus/Umbadrilus* for example).

Sketodrilus was assigned to this subfamily (Karaman, 1976) due to a similar lack of spermatozeugmata but otherwise has all the characteristics of the Tubificina. The single species was originally classified as a *Tubifex*, as was the similar *Tubifex harmani* (q.v.). The final aulodriline genus *Siolidrilus* was synonymized with *Isochaetides* by Hrabe (1967) without any detailed re-description to support the position, which now seems an unlikely alignment based on the available information.

Genus *Aulodrilus* Bretscher, 1899

1. *Aulodrilus tchadensis* Lauzanne, 1968
(1968: p. 102; Figs. 12-13)

This species is one of those *Aulodrilus* forms with oar-shaped dorsal setae behind the genital region. *Aulodrilus remex*, another in this complex, was also found in Lake Tchad. The new species has more ventral setae and smaller penial setae than *A. remex*, although both have the genital segments ahead of their usual positions. These descriptions throw some doubt on the decision to regard all of these forms with oar-shaped setae as a single species.

Distribution: Tchad.

Other information on the genus *Aulodrilus*:

Hrabe (1981) described *Aulodrilus japonicus* as a distinct species, characterized by dorsal setae with multiple upper teeth (see Fig. 6D). All the material in the Brinkhurst collection exhibits this feature. Hrabe also illustrated the male ducts of *Aulodrilus* species (Figs. 6B through D).

Genus *Neoaulodrilus* Giani, Martinez-Ansemil, Moubayed, and Dia, 1982
(1982: p. 179)

1. *Neoaulodrilus libanus* Giani *et al.*, 1982 Fig. 8K
(1982: p. 179; Figs. 1-5)

Neoaulodrilus libani is the sole species in the genus, which has tubificine characters such as cuticular penis sheaths and stacked prostates on the atria, non-aulodriline hair and pectinate setae, but bundled sperm as in the Aulodrilinae. Recent studies by Giani et al. (pers. comm.) suggest possible relationships between this and *Sketodrilus*, *Peipsidrilus*, and even *Tubifex harmani*, and may lead to the fusion of the Aulodrilinae and Tubificinae. The genus *Limnodriloides* and related new genera have been placed in a discrete marine subfamily, Limnodriloidinae, by Erseus (1982).

Genus *Sketodrilus* Karaman, 1976
(1976: p. 204)

Coelomocytes absent; vasa deferentia very long, about 3 to 4 times longer than the atria. Atria long and cylindrical; penis pear-shaped and protractile, without sheath. Sperm in bundles in spermathecae. Prostate gland solid, globular, attached to atria by a stalk. Spermathecal and penial setae absent. No gut diverticula.

Karaman (1976) erected this genus for *Tubifex flabellisetosus* and placed it close to *Aulodrilus* because of an absence of spermatozeugmata in the spermathecae (see *Tubifex harmani*).

Subfamily Telmatodrilinae

Holmquist (1974) revised the subfamily Telmatodrilinae and the genus *Telmatodrilus* Eisen, 1879, re-affirming her position that *Telmatodrilus* and *Alexandrovia* are significantly different from each other and thus cannot be considered synonymous. She further suggested the removal of *Macquaridrilus* Jamieson from the Telmatodrilinae. However, we prefer to retain all of the few known species in this subfamily within the single genus *Telmatodrilus*, at least until they become better known. *Alexandrovia* is currently regarded as a subgenus.

Genus *Telmatodrilus* Eisen, 1879

1. *Telmatodrilus bifidus* Brinkhurst and Fulton, 1979 Fig. 6G
(1979: p. 3; Figs. 15-19)

This species possesses up to 13 bifid setae anteriorly, with hollow-tipped spermathecal setae, and numerous penial setae. Spermatozeugmata are present. The male pores open into a large median depression. There are at least two prostates on each atrium.

Distribution: Tasmania, Australia.

2. *Telmatodrilus (Alexandrovia) papillatus* Brinkhurst and Fulton, 1979
(1979: p. 2; figs. 9-14) Figs. 6F, 6H

This papillate species possesses strange setae, which change from a bifid state to shovel-shaped, and then to hair setae in both dorsal and ventral postclitellar bundles, a feature unique to the Tubificina. This transition of one setal form to the next occurs between the first pre-clitellar and the immediate post-clitellar bundles. Penial setae are present. The male ducts open via a median pore.

Distribution: Tasmania, Australia.

Species incertae cedis:

3. *Rhyacodriloides abyssalis* Cekanovskaya, 1975 Fig. 6E
(1975: p. 117; Fig. 2A-E)

This species is characterized by setae which are usually simple-pointed, although some are bifid. Large single penial setae are present. The sperm exist as an amorphous mass in the spermathecae. The atria are partially covered with prostate cells, some attached singly while others are grouped. The author failed to note the similarity of this to the *Telmatodrilus* species noted above. The spermathecae are in IX rather than in X, a situation often found in *Rhizodrilus* (q.v.). A number of fragments and two whole mounts of this species were found in Lake Baikal at depths of 552 to 1610m.

Distribution: Lake Baikal, U.S.S.R.

4. *Svetlovia maculata* Cekanovskaya, 1975
(1975: p. 113; Fig. 1A-F)

This species possesses hair and bifid setae dorsally, with modified penial setae. The spermathecae are in IX, as are the testes, with the ovaries and male pores in X. The original description stated that the atria are in XI, but the pores are in the correct position in relation to the gonads, funnels and ducts. We thus suggest that the stated position of the atria is a typographical error. There are no prostate glands. Coelomocytes are present. The body wall is covered with spots.

Distribution: Lake Baikal, U.S.S.R.
depth: 680m.

It is remotely possible that this species is related to the subfamily Telmatodrilinae, although it has some features in common with *Rhyacodriloides*.

Subfamily Rhyacodrilinae

The only major changes in this subfamily have been the inclusion of the residue of the former marine subfamily Clitellinae (*Clitellio* itself having been restored to the Tubificinae) and the revision of the genus *Monopylephorus*. The type genus is becoming as diffuse as the type genus of the Tubificinae, and requires detailed revision. A considerable impediment to this revision will be the lack of type specimens.

Genus *Rhyacodrilus* Bretscher, 1901

1. *Rhyacodrilus sokolskajae* Semernoi, 1971 Fig. 7F
(1971a: p. 31; Figs. a-g)

This species was first identified as *Rhyacodrilus sinicus* and then as *R. coccineus*. *Rhyacodrilus sinicus* has now been aligned with *R. sodalis*. Both *Rhyacodrilus sinicus* and *R. sokolskajae* have protrusible pseudopenes, but *R. sinicus* is still supposed to lack pectinate setae. Brinkhurst (1971), noting his 1965 synonomy of this species, stated this lack of pectinate setae was an erroneous claim - that pectinate setae are actually present, although the intermediate teeth were very fine and difficult to see even with the most modern microscopes. The details of the separation suggested are few; the variability of *R. coccineus* in respect to distribution of hair setae and termination of male ducts needs to established. Hrabe (1981) described pseudopenes in *R. coccineus*.

Distribution: Amur, U.S.S.R.

2. *Rhyacodrilus sibiricus* Semernoi, 1971 Fig. 7E
(1971*b*: p. 38; Figs. a-f)

This species was found in association with *R. coccineus*, which it resembles except for the presence of permanently everted pseudopenes.

Distribution: Transbaikalia, U.S.S.R.

3. *Rhyacodrilus sketi* Karaman, 1974 Fig. 7G
(1974*b*: p. 225; Figs. 1, 1a)

This species is very small (3 to 4.1mm in length) with no marked distinguishing characteristic. The penial setae are solitary - an unusual characteristic. The prostate gland does not resemble those of other rhyacodriline worms. This species is compared with *R. prostatus*, now recognized as a *Phallodrilus*, but not with any other species.

Distribution: Cave of Planina, an underground system of the River Pivka in Slovenia, Yugoslavia.

4. *Rhyacodrilus tauricus* Dembitsky, 1976 Fig. 7D
(1976: p. 1720; Figs. 1-9)

This species is characterized by hair and pectinate setae, which are lyre-shaped anteriorly. The most posterior dorsal setae and the unique enlarged ventral setae of IX, X and XII are very strange. The former have very elongate, sharply-pointed lower teeth; the latter have very long and thin upper teeth and thickened shafts below the lower teeth (Fig. 5d). The penial setae on XI are simple-pointed. The terminal end of the atria is said to be "conical, extensible and functions like a penis" (translation from the original). This species is compared with *R. punctatus* because of the lyre-shaped pectinates, but is considered unique because of the penetration of the posterior wall of the atria by the vasa deferentia.

Distribution: Crimea Mountains, U.S.S.R.

5. *Rhyacodrilus svetlovi* Sokolskaya, 1976 Fig. 8L
(1976: p. 1094; Figs. 1-16)

In this species, the ventral setae in X are also large, with long upper teeth. The penial setae are more often bifid than simple-pointed. The vasa deferentia are shorter than the atria, which they enter apically. Pseudopenes are absent from the elongated atria. The hair setae are present only through segments XIII/XIV. This species is said to resemble *R. altaianus*.

Distribution: Chukchi Peninsula, U.S.S.R.

6. *Rhyacodrilus levadinovae* Sokolskaya, 1973
(1973: p. 54; Figs. 1-2)

This species lacks hair and pectinate setae dorsally. The body is marked with granular bands. There are penial setae and coelomocytes, and also protruding pseudopenes. The spermathecal pores are laterally situated. The shapes of the atria and setae as well as the position of the spermathecal pores differ from those of other species lacking hair setae.

Distribution: Kamchatka, U.S.S.R.

7. *Rhyacodrilus carsticus* Kosel, 1980 Fig. 7C
(1980: p. 609; Figs. 1-11)

All setae in this species are bifid with very long distal teeth. In X there are spermathecal setae of the blade-shaped type, with the more usual penial setae in XI. Coelomocytes are abundant, and the globular atria have diffuse prostates.

This species is presently known from caves in the C.S.S.R., and from France (Giani and Lafont, 1981).

8. *Rhyacodrilus isossimovi* Cekanovskaya, 1975
(1975: p. 120; Fig. 3A-B)

The setae in this species are bifid, with fairly long upper teeth. The penial setae number 2 or 3. The atria are spherical, with diffuse prostates. There are no pseudopenes. This species is compared with *R. stephensoni*; while the setae and atria are said to differ in shape, the differences are not profound.

Distribution: Lake Baikal, U.S.S.R.

9. *Rhyacodrilus fultoni* Brinkhurst, 1982
(1982*b*: p. 2; Pls. 1-5)

The setae in this species are bifid with equally long teeth, 10 to 13 per bundle anteriorly. Penial setae number 7 to 9. Protrusible pseudopenes seem to be associated with short, curved atria with large penis sacs. Prostate glands are lacking, just as in another antipodean species, *Rhyacodrilus (Taupodrilus) simplex.*

Distribution: Australia.

10. *Rhyacodrilus bifidus* Brinkhurst, 1982
(1982*b*: p. 3; Pl. 6)

This species has fewer bifid setae than *Rhyacodrilus fultoni*.

Foreign matter is usually found adhering to the body wall. The setae have long distal teeth, and are enlarged anteriorly. Penial setae are present. Prostate glands and pseudopenes are present.

Distribution: Australia.

Other *Rhyacodrilus* information:

Rhyacodrilus altaianus is clearly a distinct species with unusual hair-like penial setae, observed by Hrabe (1974) and on the original specimens by Brinkhurst (1981*b*). *Rhyacodrilus lepnevae* was originally confused with *R. altaianus*, as both are pigmented and were present in Lake Teleckoje, the type locality of *R. lepnevae* according to Hrabe (1974). Penial setae and coelomocytes are actually lacking in *R. lepnevae*. The ventral bundles of III through VI are a mix of bifid and simple-pointed setae. The dorsal setae are hairs and pectinates. The spermathecal pores on IX lie well above the ventral setal line posteriorly. The prostates are diffuse and the pseudopenes are conical - both characteristics of other asiatic *Rhyacodrilus* species. Sokolskaya (1976) suggested that *R. lepnevae* might not be a *Rhyacodrilus* because of the lack of penial setae and coelomocytes. This species adds to the confusion of this genus and supports the need for revision.

Rhyacodrilus arthingtonae Jamieson (1978) is now aligned with *Rhizodrilus* (q.v.).

Rhyacodrilus punctatus may lack the pectinate ventral setae thought to be characteristic of the genus (Hrabe, 1973), a thought which may throw some doubt on the identity of North American specimens (Cook, 1975). This question is currently being investigated. Sokolskaya (1968) had already established that *Rhyacodrilus riabuschinskii* and *R. coccineus* are synonymous.

Rhyacodrilus caudosetosus Karaman and *Rhyacodrilus maculosus* Karaman mentioned by Kerovec and Mrsic (1981) seem to be undescribed species.

Rhyacodrilus falciformis was re-described by Kasprzak (1979) and was reported from North America by Brinkhurst (1978). *Rhyacodrilus subterraneus* was reported from the Tambre River in Spain by Martinez-Ansemil and Giani (1980).

The genital setae of *Rhyacodrilus subterraneus* were described by Giani and Martinez-Ansemil (1981).

Rhyacodrilus palustris is accepted as a valid species by Kasprzak (1981).

Hrabe (1981) illustrated the penes in *Rhyacodrilus coccineus*, which raises more questions about the validity of these new taxa (Fig. 7H).

It is impossible to cite a reliable species list as too many species have been described without sufficient attention to comparisons with the existing taxa, and a revision is badly needed.

Genus *Monopylephorus* Levinsen, 1884

This genus was revised and divided into three genera by Baker and Brinkhurst (1981); those decisions simply will be listed here as follows:

1. *Monopylephorus* Levinsen, 1884

   M. rubroniveus Levinsen - type; other species: *M. aucklandicus*, *M. cuticulatus*, *M. evertus*, *M. irroratus*, *M. kermadecensis*, *M. limosus*, and *M. parvus*.

2. *Rhizodrilus* F. Smith, 1900

   Rhizodrilus lacteus Smith - type (Fig. 7A); other species: *R. africanus*, *R. arthingtonae*, *R. lawryi*, and *R. pacificus*.

3. *Peristodrilus* Baker and Brinkhurst, 1981 (1981: p. 958)

   Peristodrilus montanus (Hrabe) - type.

Other *Monopylephorus* information:

Monopylephorus frigidus Brinkhurst and *Monopylephorus longisetosus* Brinkhurst and Baker are reassigned to the Phallodrilinae. Finogenova (1982) independently reviewed these genera and added two new subspecies: *Monopylephorus rubroniveus iturupi* and *Monopylephorus irroratus orientalis*.

Genus *Branchiura* Beddard, 1892

This monotypic genus was once regarded as constituting a subfamily on its own, but Baker and Brinkhurst (1981) relegated it to the Rhyacodrilinae after recognizing the relationship between this and *Rhizodrilus*.

Genus *Epirodrilus* Hrabe, 1930

1. *Epirodrilus slovenicus* Karaman, 1976 Fig. 6K
(1976: p. 201; Figs. 1-8)

Hair and pectinate setae are present in this species, with only bifids present behind the clitellum. Penial setae are present in XI. This species is close to *Epirodrilus pygmaeus* (still regarded as a *Moraviodrilus* by Hrabe, 1982), but differs in a number of characteristics, including the presence of penial setae.

Distribution: Yugoslavia.

Other *Epirodrilus* material:

Epirodrilus pygmaeus was reported from France by Giani and Martinez-Ansemil (1981*a*), who complemented the original description of this species (see Figs. 6J, 6L). This species was also reported from Poland (Kasprzak 1981) and ? Yugoslavia (Hrabe 1982). Some authors retain the genus *Moraviodrilus* for this taxon.

Genus *Bothrioneurum* Stolc, 1888

Timm (1979) redescribed *Bothrioneurum vejdovskyanum* and synonymized it with *Bothrioneurum pyrrhum* Marcus. Timm identified his material under the name *vejdovskyanum* partly because it was the only Holarctic species. His specimens show some similarity to *B. pyrrhum* apart from fewer penial setae, and different position of "hearts" and integumental network, all of which Timm considered to be potentially intraspecific variables, especially in asexual reproductive forms. The original diagnostic characteristics of *B. pyrrhum* have been recognized in specimens of *B. vejdovskyanum*.

Genus *Protuberodrilus* Giani and Martinez-Ansemil, 1979 Fig. 6I
(1979: p. 291; Fig. 1A-E)

1. *Protuberodrilus tourenqui* - type

This monotypic genus has bifid setae and modified setae in IX, X and XII but not in XI (unusual in Rhyacodrilinae). There is a large median porophore in XI/XII bearing both male pores near the median line. The male ducts are typically rhyacodriline but distinctive.

Distribution: Tambre River, Spain.

Subfamily Phallodrilinae Brinkhurst, 1971

This subfamily is made up primarily of marine species (see many papers of C. Erseus and H. R. Baker, as well as reviews in Brinkhurst, 1982*a*, and Giere and Pfannkuche, 1982). Two new species of the genus *Phallodrilus* occur in freshwater.

Genus *Phallodrilus* Pierantoni, 1902

1. *Phallodrilus hallas* Cook and Hiltunen, 1975
(1975: p. 936; Fig. 1A-F)

A small worm, like most marine species, about 2.8 to 3.7mm long. This species has 3 to 5 bifid setae in each anterior bundle. These setae however become simple-pointed, through the loss of the distal tooth, on XXIII dorsally but XXIX ventrally. Three to six penial setae are present in the ventral bundles of XI. The two stalked prostates characteristic of this subfamily are both present on each patrium. The male pores are on conical porophores.

Distribution: Lake Superior, North America.

2. *Phallodrilus riparius* Giani and Martinez-Ansemil, 1981
(1981: p. 202; Fig. 1A-D)

All the setae of this species are bifid; 2 to 5 anteriorly and 2 to 3 posteriorly. The penial setae number 4 per bundle. Pseudopenes are present.

Distribution: Tambre River, Galice, Spain.

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FAMILY PHREODRILIDAE

As in *Haplotaxis*, this small family contains in a single genus, *Phreodrilus*, although several subgenera are recognized. Again, this is a situation that may be amended once more as species are described and the range of variation becomes firmly established.

1. *Phreodrilus mauienensis* Brinkhurst, 1971
(1971: p. 107; Fig. 1K)

This new member of the subgenus *Phreodrilus* has long eversible pseudopenes and a small globular organ - the position of which was re-assessed by Brinkhurst (1982). The ventral setae are dissimilar. Immature specimens from Australia (Naidu and Naidu, 1980) cannot be identified for certain.

Distribution: New Zealand.

2. *Phreodrilus* (*Insulodrilus*) *plumaseta* Brinkhurst and Fulton, 1979
(1979: p. 4; Figs. 23-27)

As the name suggests, the dorsal setae are brush-like. Spermathecal are present in XIII. Brinkhurst (1982) reassigned this species to *Insulodrilus*.

Distribution: Tasmania.

3. *Phreodrilus* (*Insulodrilus*) *nudus* Brinkhurst and Fulton, 1979
(1979: p. 5; Figs. 20-22)

The ventral setae are similar to each other, the spermathecal setae are paired, and there are well-developed vestibulae associated with the spermathecal pores.

Distribution: Tasmania.

4. *Phreodrilus* (*Insulodrilus*) *magnaseta* Brinkhurst and Fulton, 1979
(1979: p. 5; Figs. 28-32)

The name describes the progressively enlarged ventral setae from II to VIII, which are diagnostic along with the brush-tipped dorsals.

Distribution: Tasmania.

5. *Phreodrilus (Insulodrilus) breviatria* Brinkhurst and Fulton, 1979 (1979: p. 6; Figs. 33-36)

There is an unusual abundance of dorsal hair-like setae, up to 13-16 per bundle in median segments. The vasa deferentia are unusual in that they open into the atria instead of into the basal section or ejaculatory duct; the atria are very short and broad.

Distribution: Tasmania.

6. *Phreodrilus (Phreodrilus) palustris* Brinkhurst and Fulton, 1979 (1979: p. 6; Figs. 39-43)

This species also has more than the usual number of dorsal setae (up to 19) but has elaborate eversible pseudopenes.

Distribution: Tasmania.

7. *Phreodrilus (Antarctodrilus) proboscidea* Brinkhurst and Fulton, 1979 (1979: p. 7; Figs. 44-46)

Originally described almost solely on the presence of the proboscis (unique in this family), the description was expanded by Brinkhurst (1982). The hair setae are serrate. The penes are covered with foreign matter, as are the accessory structures resembling those of *P. mauienensis*.

Distribution: Tasmania.

8. *Phreodrilus (Insulodrilus) uniseta* Brinkhurst, 1982 (1982: p. 9; Figs. 11-14)

This partially described species is unique in that the dorsal setae are single, sigmoid and simple-pointed and there are no hair setae. The reproductive system is typical for the subgenus.

Distribution: Tasmania.

9. *Phreodrilus (Insulodrilus) tanganyikae* Brinkhurst, 1970 (1970: p. 105; Fig. 1)

The ventral setae are bifid, and there are spermathecal setae. The penes have cuticular sheaths (unique in the family) and the spermathecae have large vestibulae. Brinkhurst (1982) transferred the species to the subgenus *Insulodrilus*.

Distribution: Africa.

Other *Phreodrilus* material:

Brinkhurst (1982) recorded *Phreodrilus niger* from Australia for the first time.

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FAMILY OPISTOCYSTIDAE

The family Opistocystidae was completely revised by Harman and Loden (1978), who defined *Opistocysta funiculus* Cordero (S. America, ? Africa); *O. serrata* Harman, incertae sedis (Paraguay); *O. flagellum* (Leidy), as species inquirende (U.S.A.); *Trieminentia corderoi* (Harman) (Central and South America), and *Crustipellis tribranchiata* (Harman) (U.S.A.).

According to Corliss (1970), the descriptions of opistocystids by Harman in an earlier publication must be cited as being published in 1970, not 1969, because the October 1969 issue of Trans. Amer. Micros. Soc. 88 (4) was published January 28, 1970. Harman and Loden (1978) perpetuated this technical error.

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FAMILY NARAPIDAE

This new family was created for *Narapa bonettoi* by Righi and Varela (1983).

1. *Narapa bonettoi* Righi and Varela, 1983 Fig. 1G
(1983: p. 19; Figs. 1-6)

This worm is small (3.0-4.5mm) in length, and lacks setae. The nervous system displaces the body wall muscles. The testes are in V, male ducts lie in VI (apart from the funnels) and constitute a short vas deferens, a glandular atrium and a penial device. The ovaries are in VII, as are the spermathecal pores, but the spermathecal ampullae are located further back at the end of long ducts (as in the Phreodrilidae).

Distribution: Parana River, Corrientes, Argentina.

LITERATURE CITED

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CLASS APHANONEURA

The families Aeolosomatidae and Potamodrilidae were placed in the Subclass Aphanoneura by Timm (1981), completing the revision indicated by Brinkhurst and Jamieson (1971). Brinkhurst (1982) elevated this to a class so as to maintain parity with the Class Oligochaeta, but noted that both Oligochaeta and Hirudinea are often regarded as subclasses of the Clitellata. As the Aphanoneura do not have a clitellum (only a ventral copulatory gland, of which analogues if not homologues are seen in oligochaetes that also have a true clitellum) they would still be regarded as a class in comparison to the Clitellata and the Polychaeta.

1. *Aeolosoma maritimum* Westheide and Bunke, 1970
(1970: P. 135; Figs. 2, 3)

This species has 3 to 5 hair setae in each setal bundle, a single field of cilia on the prostomium, no ciliary pits and orange-yellow glands. This is the first species in this family known to occur in marine environments.

Distribution: A sandy beach in the Bay of Tunis.

2. *Aeolosoma markewitschi* Boshko and Pashkevichute, 1975
(1975: p. 75; Fig. 1a-g)

Description not translated.

This species is known only from the gill cavities of *Astacus leptodactylus leptodactylus* (Decapoda: Astacidae).

Distribution: Dnieper and southern Bug basins, U.S.S.R.

Other *Aeolosoma* information:

Naidu, Kalpana, and Kumar (1981) reported *Aeolosoma hyalinum* Bunke as a new record from the Indian subcontinent.

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LAKE BAIKAL OLIGOCHAETA

Several recent papers on the fauna of Lake Baikal add new information to earlier species descriptions, or describe new species as follows:

Hrabe, 1982:

Tubificidae: *Isochaetides excavatus* n. sp., *Isochaetides acapillatus* (Finogenova), *Peloscolex inflatus* Michaelsen, *Lycodrilus dyborowskii* Grimm *Lycodrilides schizochaetus* (Michaelsen).

Lumbriculidae: *Pseudolycodrilus parvus* (Michaelsen), *Lamprodrilus novikovae* n. sp., *Teleuscolex glaber* n. sp., *Kozovetta miranda* n. sp., *Pseudorhynchelmis olchonensis* (Burov and Kozov), *Styloscolex solzanicus* n. sp.

Naididae: *Nais tygrina* Isossimov.

Semernoi, 1982:

Tubificidae (but not all securely placed in their genera): *Isochaetides eximius* n. sp., *Isochaetides adenodycystis* n. sp., *Tubifex crassipelus* n. sp., *Tubifex kessleri baicalensis, Tubifex kessleri variabilis, Tubifex penicraspedifer, Tubifex speciosus vestus.*

Lumbriculidae: *Stylodrilus cerepanovi* n. sp., *Lamprodrilus glandulosus* Michaelsen, *Rhynchelmis spermatochaeta* n. sp.

Snimshchikova, 1982:

Tubificidae (not all secure in their genera): *Lymphachaeta pinnigera* n. sp., *Svetlovia maculata* n. sp., *Tubifex mirandus* n. sp., *Peloscolex malevici* Cekanovskaya, *Peloscolex exilis* n. sp., *Peloscolex cristatus* n. sp., *Peloscolex solitarius* n. sp., and *Peloscolex falcatus* n. sp.

Brinkhurst, 1984:

This paper provided a comprehensive account for all Tubificidae described to that date. Twenty-five species in 10 genera are now reported from Lake Baikal, twenty species of which are considered endemic. The number of species in each genus is uncertain because of remaining taxonomic problems, discussed therein. The family Lycodrilidae (Cekanovskaya 1962, translated 1981) was dissolved. Three species were re-assigned to other genera: *Tubifex excavatus* (Hrabe), *Baikalodrilus inflatus* (Michaelsen), and *Lycodrilides grubei* (Michaelsen).

Species described by Hrabe (1970) (*Stylodrilus minutus*), Isossimov (1972) (*Tubifex [= Limnodrilus] infundibuliferus*), Cekanovskaya (1975) (*Tubifex baxikalovae*, *Tubifex taediosus*, *Rhyacodrilus isossimovi*, *Peloscolex malevici*, *Rhyacodriloides abyssalis*, *Svetlovia maculata*, and *Tubifex minutus*), and Holmquist (1979) (*Baikalodrilus digitalis*) have been listed previously under their respective genera, though some of these species now appear to be subject to revision.

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APPENDIX 1.

The following illustrations (all redrawn by R. O. Brinkhurst, K. Bruce, H. R. Baker, and K. A. Coates) are drawn from original sources referred to in the text. Some simplification for the sake of uniformity has been imposed on the original styles. Readers are urged to consult the original sources and not to rely on these general indications of the structures illustrated.

Figure 1. Lumbriculidae, Haplotaxidae, Narapidae.

(A-F) Haplotaxidae. (A) *Haplotaxis corbarensis* median setae; (B) *Haplotaxis navarrensis* setae of segment 100; (C) *Haplotaxis cantabronensis* setae of segment 100; (D) *Haplotaxis ornamentus* seta; (E) *Haplotaxis brinkhursti* a) genital segments; b) male ducts and posterior testes; (F) *Tiguassu reginae* a) anterior end; b) genital segments with non-functional anterior male duct and one pair of testes.

(G) Narapidae. (G) *Narapa bonettoi* male duct.

(H-V) Lumbriculidae. (H) *Thinodrilus ambiguus* genital segments; (I) *Thinodrilus genitosetosus*; (J) *Trichodrilus montenegrensis* male duct; (K) *Trichodrilus allegheniensis*; (L) *Trichodrilus culveri*; (M) *Trichodrilus aporophorus*; (N) *Trichodrilus seirei* a, b - two forms of atrium in genital segments; (O) *Bythonomus sovaliki*; (P) *Stylodrilus beattiei*; (Q) *Stylodrilus longiatriatus*; (R) *Styloscolex macer*; (S) *Styloscolex opisthothecus*; (T) *Eclipidrilus levanidovi*; (U) *Rhynchelmis alaskana*; (V) *Spelaedrilus multiporus*. In all instances anterior to left (above in (lR)).

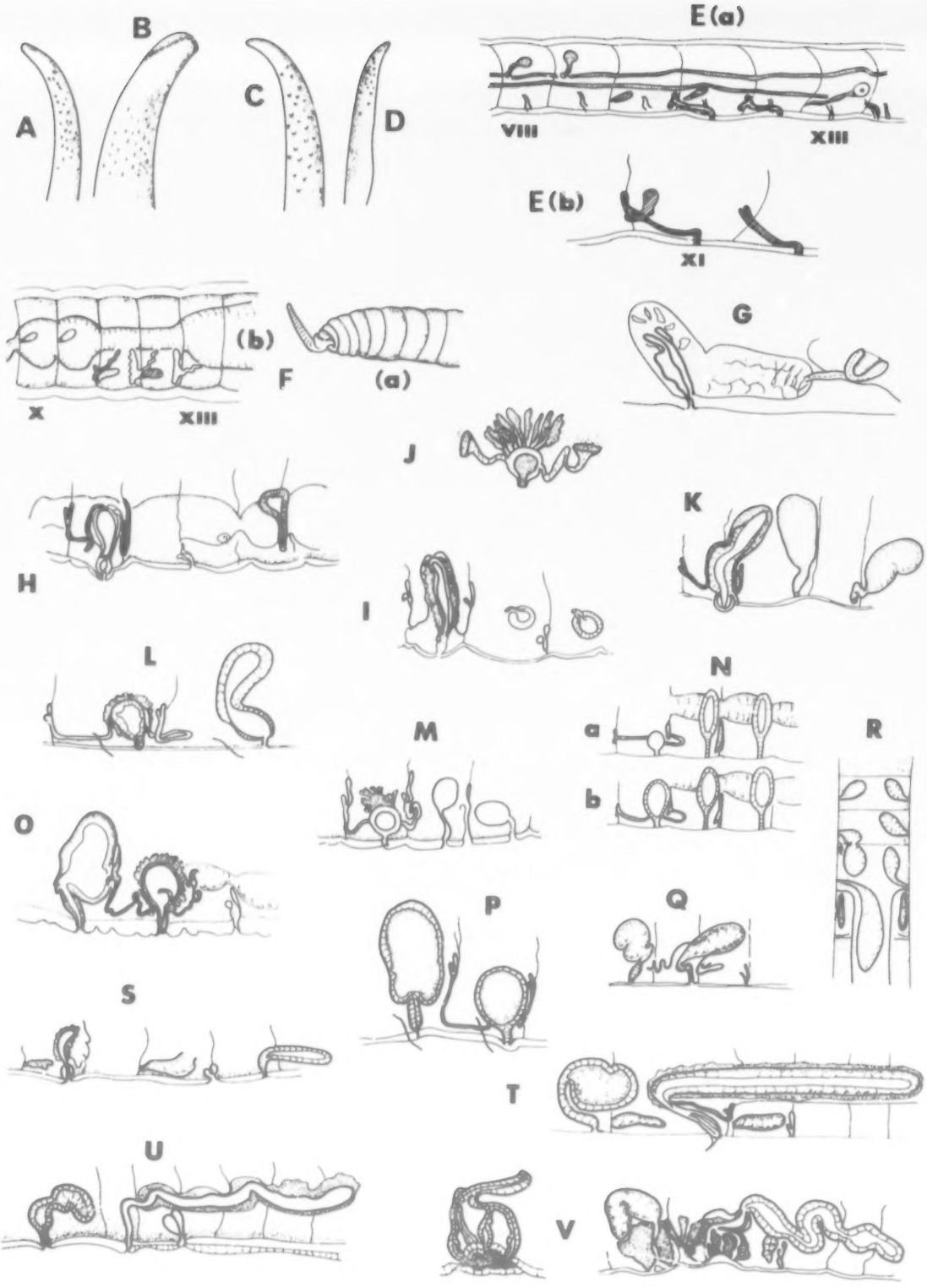
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Figure 2. Naididae.

(A) *Paranais multisetosa* spermatheca and male duct (anterior to left); (B) *Specaria fraseri*; (C) *Nais magnaseta*; (D) *Nais christinae*; (E) *Nais stolci*; (F) *Rhopalonais africana*; (G) *Piguetiella michiganensis*; (H) *Dero magna*; (I) *Dero trifida*; (J) *Dero floridana*; (K) *Dero abranchiata*; (L) *Dero bimagnisetus*; (M) *Dero moghei*; (N) *Stephensoniana tandyi*; (O) *Pristina unidentata*; (P) *Pristina arcaliae*; (Q) *Pristina napocensis*; (R) *Pristina longisoma*; (S) *Amphichaeta americana*; (T) *Amphichaeta raptisae*; (U) *Amphichaeta leydigii*.

a) anterior ventral setae; d) needle (dorsal) setae; g) gill chamber; p) posterior ventral setae; pn) penial setae; s) spermathecal setae; II, III etc. segment numbers.

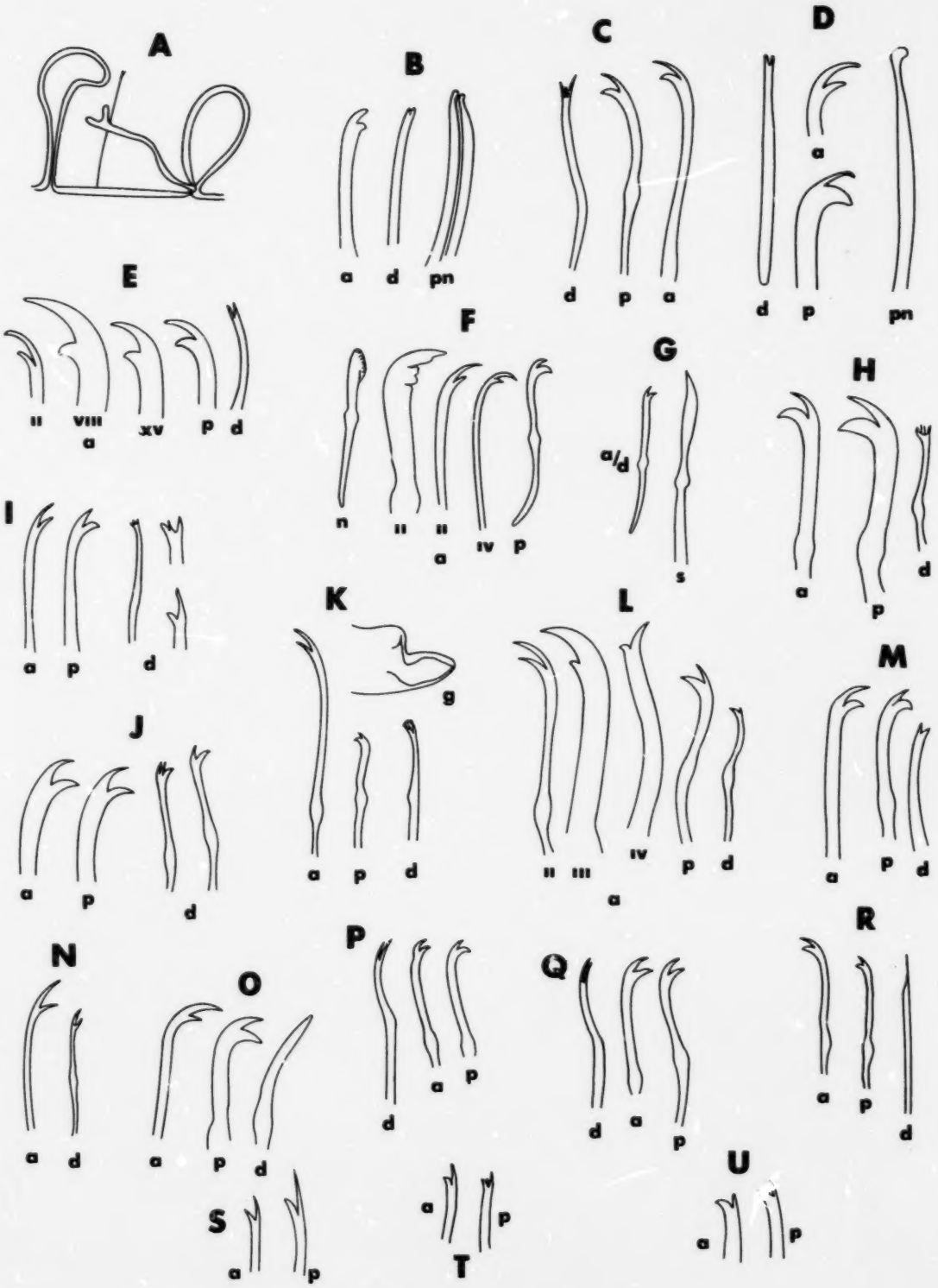
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Figure 3. Tubificidae (part).

(A) *Tubifex hrabei* atrium, penis sheaths; (B) *Tubifex taediosus* male duct and spermatheca; (C) *Tubifex minutus* male duct and spermatheca; (D) *Tubifex costatus* penis; (E) *Tubifex bazikalovae* male duct and spermatheca; (F) *Tubifex solitarius* male duct and spermatheca; (G) *Tubifex harmani* male duct and penis sheath; (H) *Tubifex smirnovi* male duct and penis sheath; (I) *Tubifex montanus* male duct and penis; (J) *Tubifex nerthus* atrium and ? penis.

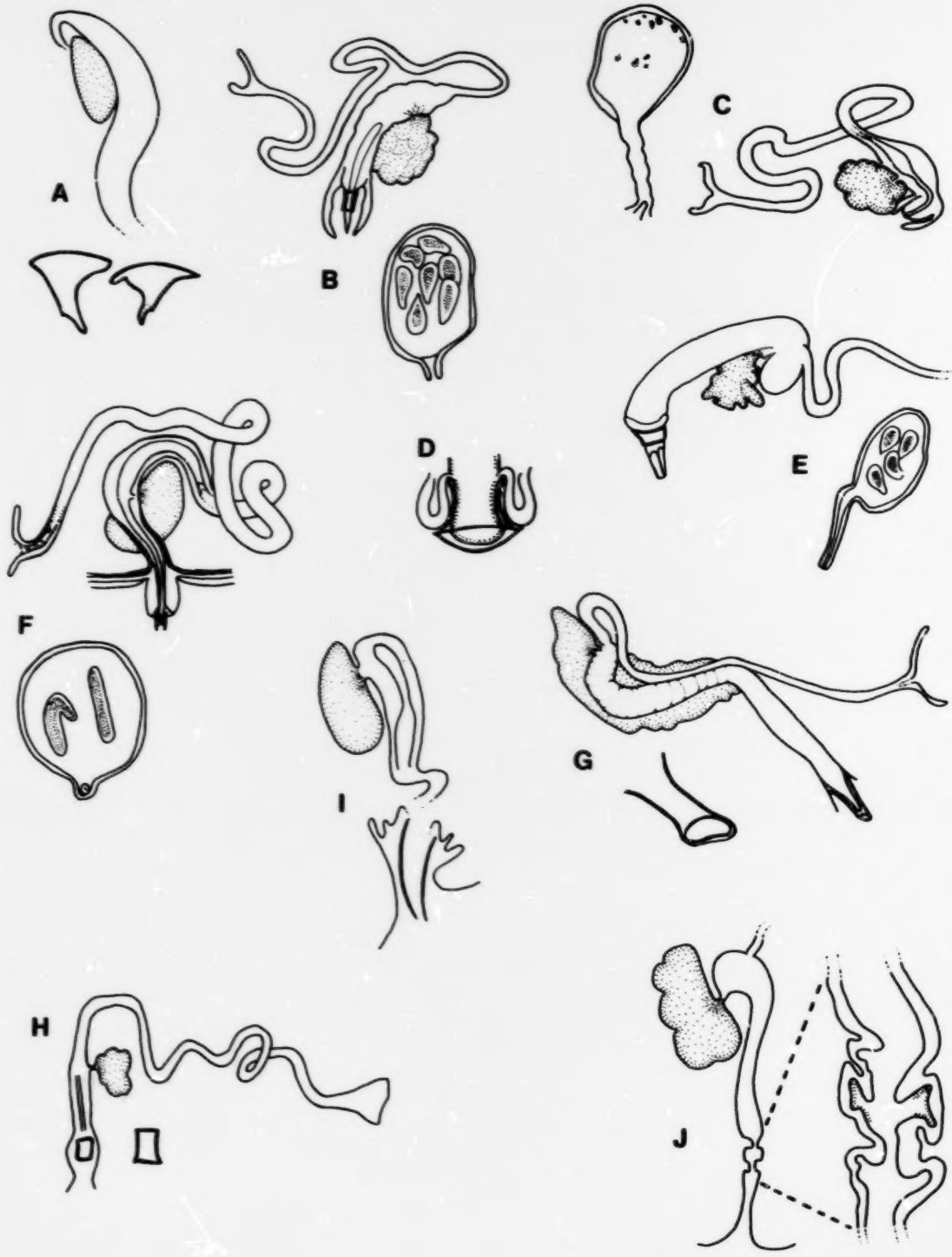
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Figure 4. Tubificidae (part).

(A) *Haber svirenkoi* male duct; (B) *Isochaetides michaelseni* male duct and penis; (C) *Antipodrilus timmsi* spermatheca, male duct and penis; (D) *Antipodrilus plectilus* male duct; (E) *Antipodrilus multiseta* male duct; (F) *Ilyodrilus mastix* male duct; (G) *Potamothrix postojnae* male duct and penis; (H-L) Spermathecal setae, *Potamothrix bedoti*, *Potamothrix bavaricus*, *Potamothrix thermalis*, *Potamothrix hammoniensis*, *Potamothrix heuscheri*; (M) *Limnodrilus bulbiphallus* penis and male duct; (N) *Limnodrilus psammophilus* penis sheath; (O) *Limnodrilus rubripenis* penis sheaths; (P) *Limnodrilus variesetosus* penis; (Q) *Peipsidrilus pusillus* male duct and penis sheath; (R) *P. saamicus* male duct.

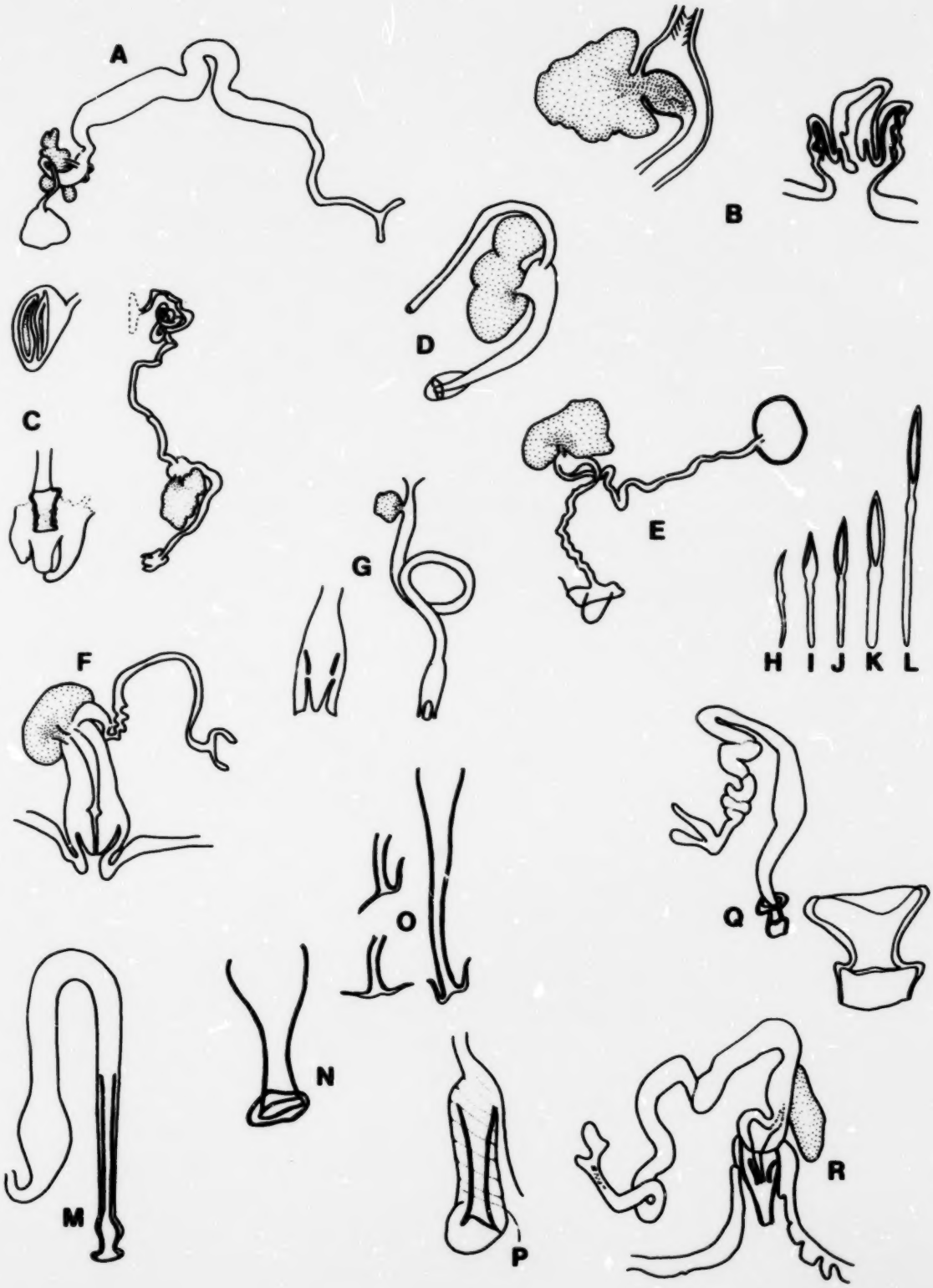
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Figure 5. Tubificidae (part).

(A) *Psammoryctides californianus*; (B) *Psammoryctides minutus*; (C) *Psammoryctides convolutus*; (D) *Psammoryctides hadzii*; (E) *Psammoryctides stankoi*; (F) *Psammoryctides hrabei* - all male ducts, the last with spermatheca; (G-H) penes of *Psammoryctides barbatus*; (I) penes of *Psammoryctides albicola*; and (J) penes of *Psammoryctides moravicus*.

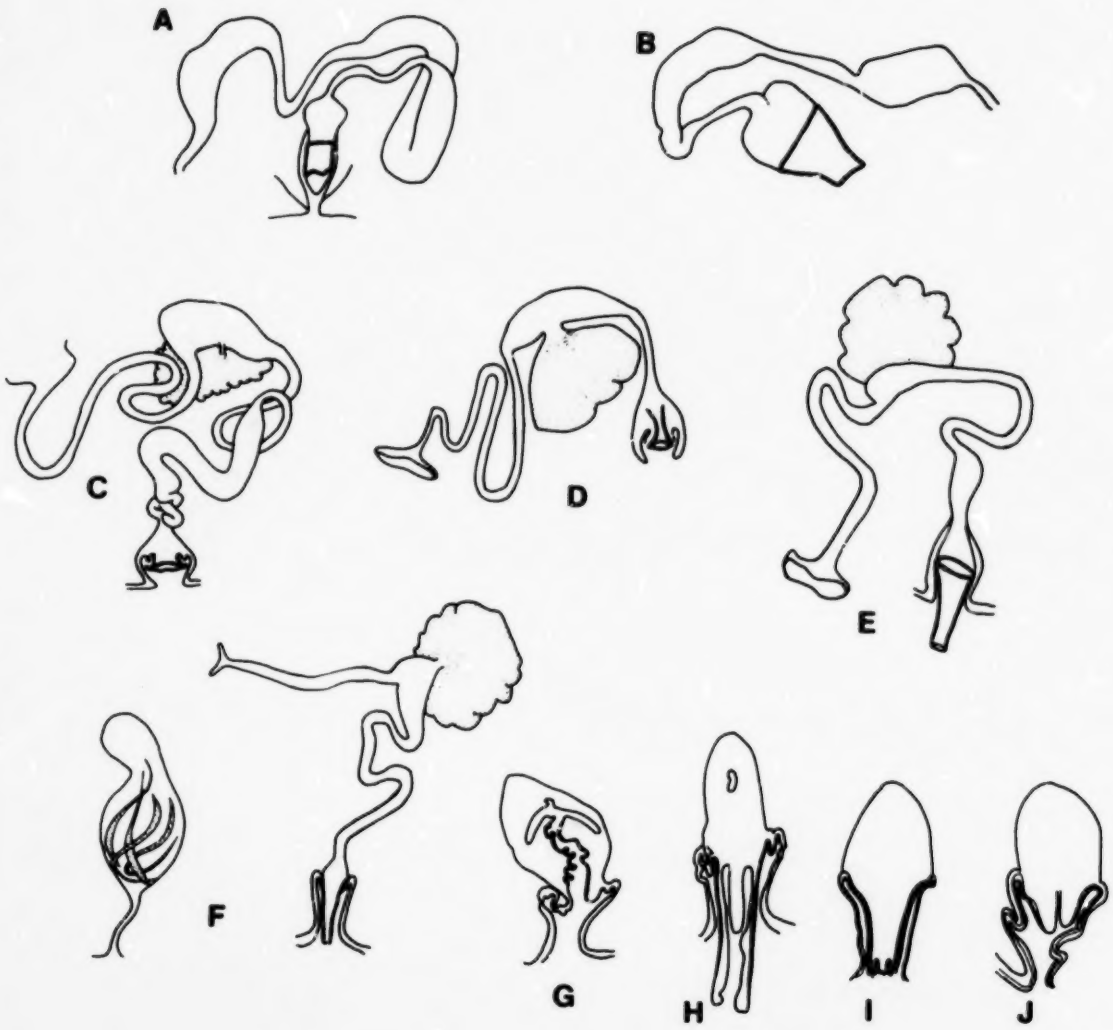
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Figure 6. Tubificidae (part).

(A) *Sketodrilus flabellisetosus* male duct; (B) *Aulodrilus pigueti* penis; (C) *Aulodrilus pluriseta* penis; (D) *Aulodrilus japonicus* male duct; (E) *Rhyacodriloides abyssalis* a) atrium and penial seta, b) atrium and setal sac, c) dorsal setae of IV, d) penial setae; (F) *Telmatodrilus papillatus* setae a) ventrals of IV, b) ventrals of VIII, c) from XI-XIII, d) posterior seta; (G) *Telmatodrilus bifidus* spermatheca and male duct; (H) *Telmatodrilus papillatus* male duct with median pore and penial setae; (I) *Protruberodrilus tourenqui* male duct and penis; (J) *Epirodrilus pygmaeus* male duct; (K) *Epirodrilus slovenicus* male duct; (L) *Epirodrilus pygmaeus* male duct.

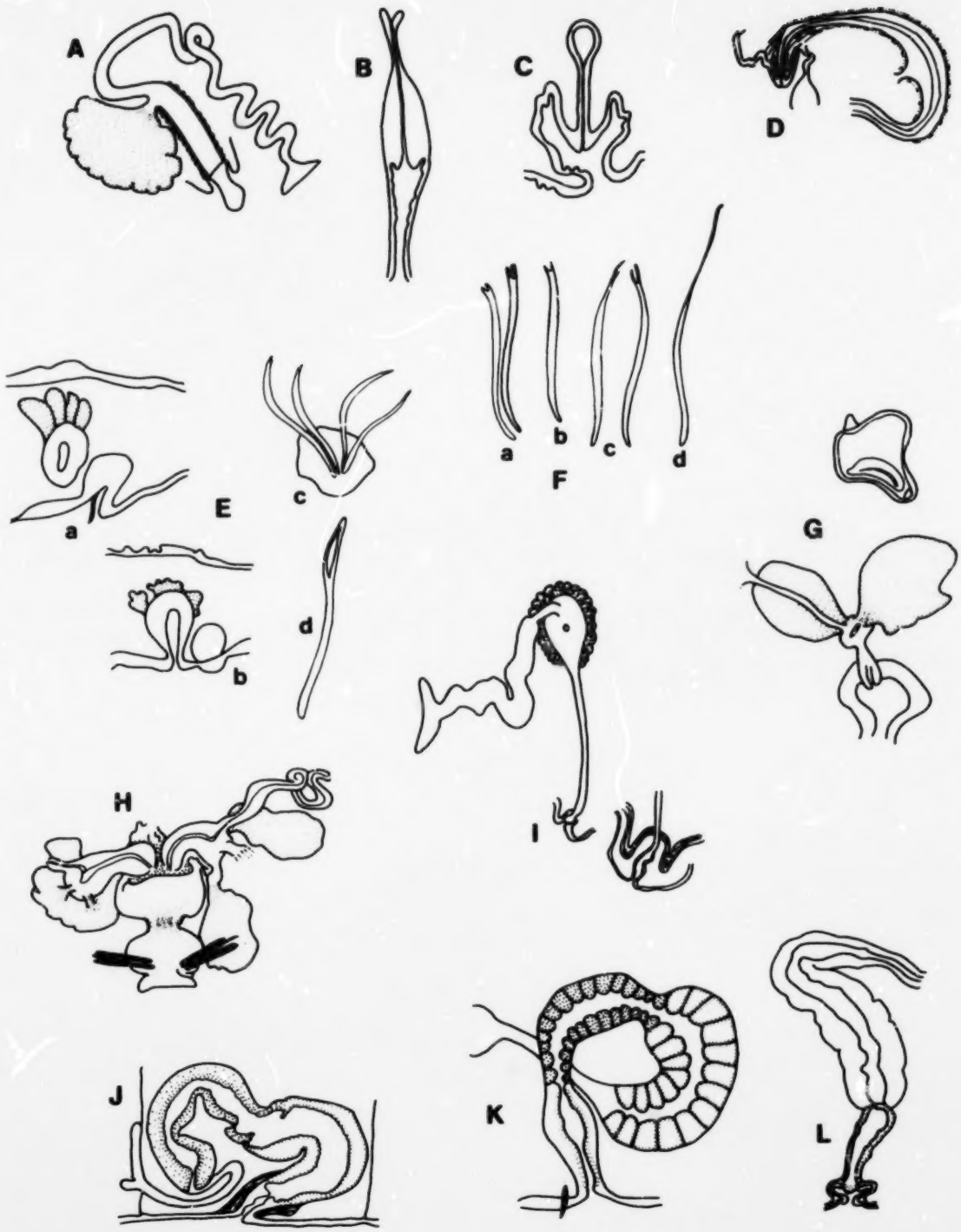
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Figure 7. Tubificidae (part).

(A) *Rhizodrilus lacteus* male duct; (B) *Bothrioneurum vejdovskyanum* male duct; (C) *Rhyacodrilus carsticus* a-g setae, a) dorsal anterior, b) dorsal posterior, c) ventral anterior, d) ventral posterior, e) dorsal XI, f,g) spermathecal setae, h) male duct; (D) *Rhyacodrilus tauricus* a-g setae a) dorsal VII, b) dorsal XVI, c) dorsal LXX, d) ventral VII, e) ventral XVI, f) spermathecal seta, g) penial seta, h) spermatheca and male duct; (E) *Rhyacodrilus sibiricus* male duct and spermatheca; (F) *Rhyacodrilus sokolskajae* atria with pseudopenes inverted and everted; (G) *Rhyacodrilus sketi* male duct and penial seta; (H) *Rhyacodrilus coccineus* atria with pseudopenes inverted and everted; (I) *Rhyacodrilus falciformis* atrium and penis.

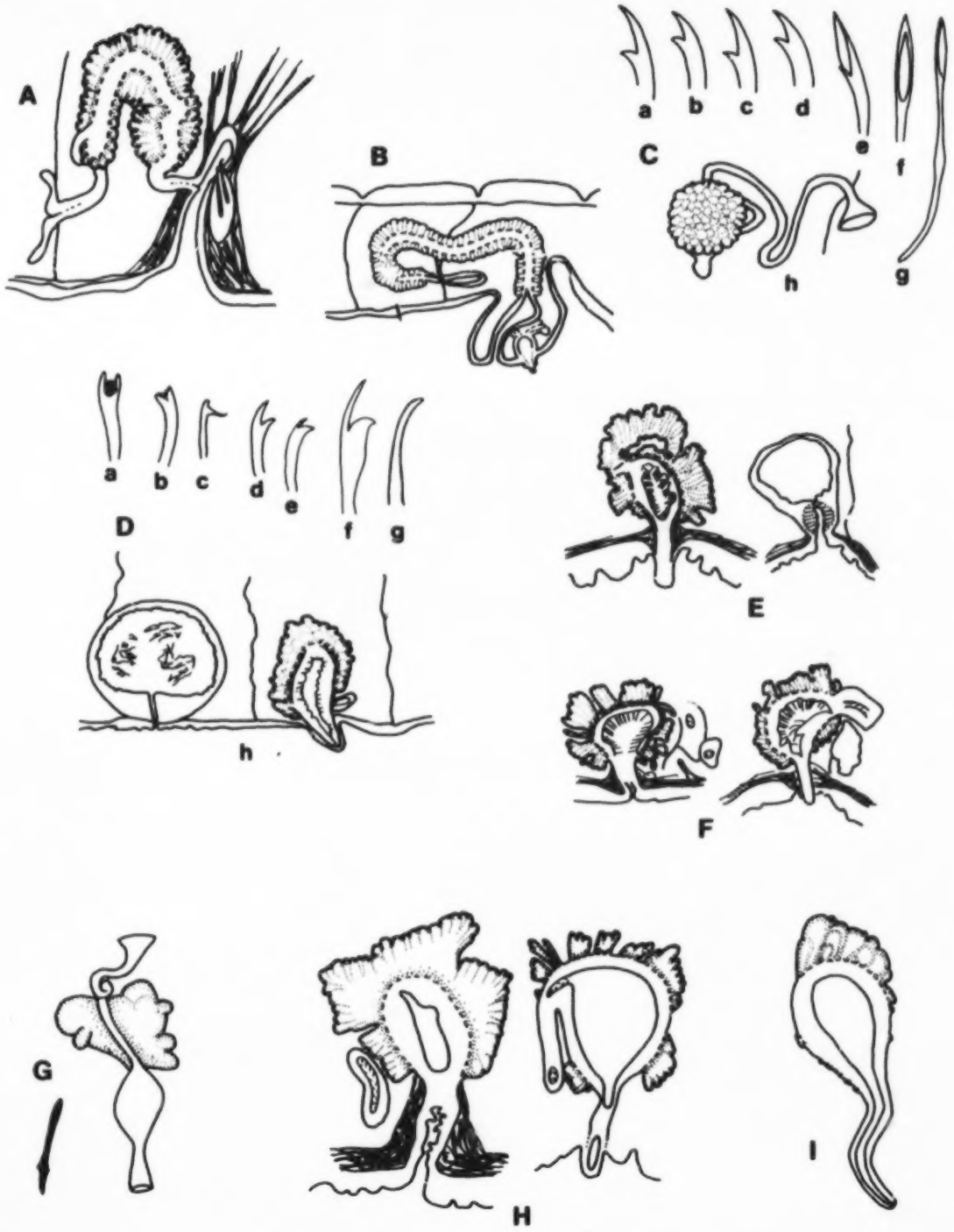
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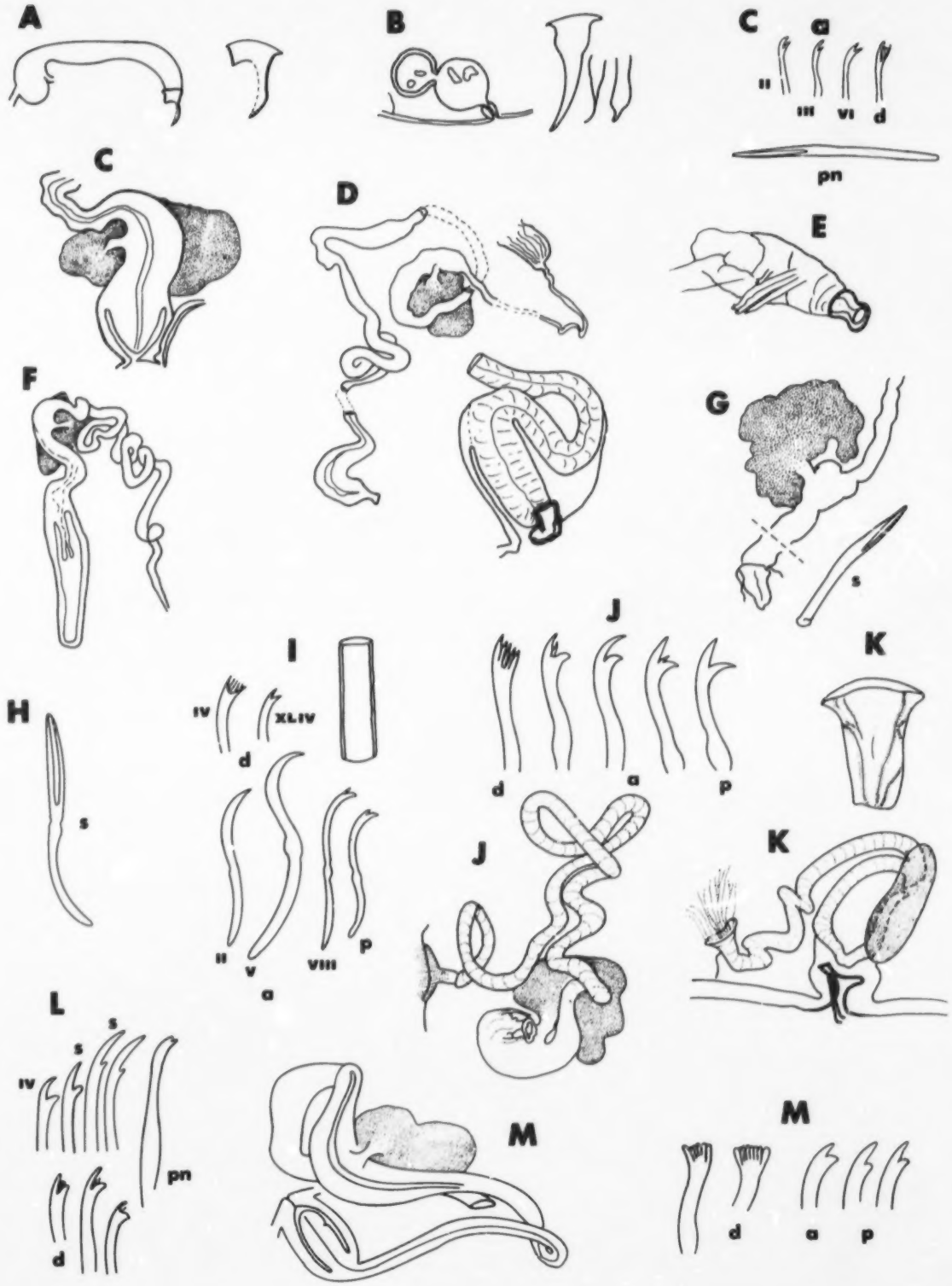
Figure 8. Tubificidae (part).

(A) *Tubifex excavatus* atrium and penis sheath; (B) *Tubifex acapillatus* spermatheca and penis sheaths; (C) *Tubifex hubsugulensis;* (D) *Varichaetadrilus fulleri* male duct and penis; (E) *Varichaetadrilus pacificus* penis, and somatic and penial setae; (F) *Isochaetides tomilovi* male duct; (G) *Tubifex baicalensis* male duct and spermathecal seta; (H) *Potamothrix alatus* spermathecal seta; (I) *Peloscolex pescei* penis sheath and setae; (J) *Peloscolex coiree* male duct and setae; (K) *Neoaulodrilus libanus* penis sheath and male duct; (L) *Rhyacodrilus svetlovi* setae; (M) *Arctodrilus wulikensis* male ducts and setae. a) anterior ventral setae; d) dorsal setae; p) posterior ventral setae; pn) penial setae; s) spermathecal setae; II, III, etc. segments.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ERRATA

1. p. v ACKNOWLEDGEMENTS line 6 add "and J.D. Unzicker"
2. p. 4 line 25 "one pair of atria"
3. p. 5 "synonym of Lumbriculus it should be re-named, because"
4. p.14 line 22 "Smith and Dickey"
5. p.28 line 15 "(1973a: p154;....)"
6. p.32 line 8 "(Harman, 1973b: p.71....)"
7. p.33 line 3 from bottom "(1973a: p.161...)"
8. p.34 line 5 from bottom "Harman (1973a)"
9. p.36 lines 4,7 Harman, W.J. 1973a .....or 1973b respectively
10. p.65/7 Cook, D.G. and J.K. Hiltunen - mislocated
11. p.70 Popchenko 1976a - delete.

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